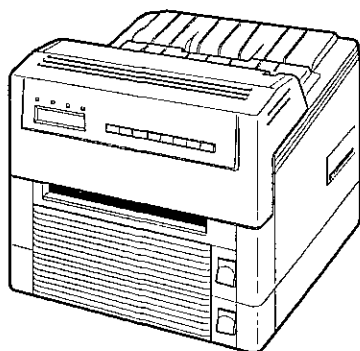


SHARP SERVICE MANUAL

CODE: 00ZJX9600SM/E



LASER PRINTER

JX-9600

MODEL JX-9600PS

CONTENTS

GENERAL
PRINT ENGINE
INTERFACE CONTROL UNIT (ICU)

CAUTION

This laser printer is a class 1 laser product that complies with 21CFR 1040.10 and 1040.11 of the CDRH standard and IEC825. This means that this machine does not produce a hazardous laser radiation. The use of controls, adjustments or performance of procedures other than those specified herein may result in hazardous radiation exposure.

This laser radiation is not a danger to the skin, but when an exact focusing of the laser beam is achieved on the eye's retina, there is danger of spot damage to the retina.

The following cautions must be observed to avoid exposure of the laser beam to your eyes at the time of servicing.

- 1) When a problem in the laser optical unit has occurred, the whole optical unit must be exchanged as a unit, not an individual part.
- 2) Do not look into the machine with the main switch turned on after removing the developer unit, toner cartridge, and drum cartridge.
- 3) Do not look into the laser beam exposure slit of the laser optical unit with the connector connected when removing and installing the optical system.
- 4) The upper frame and the middle frame contains the safety interlock switch.

Do not defeat the safety interlock by inserting wedges or other items into the switch slot.

CLASS 1
LASER PRODUCT

LASER KLASSE 1

LASER WAVE - LENGTH : 780 ± 10nm
Pulse times : 45 ± 2µs/7mm
Out put power : 0.35mW ± 0.05mW

CAUTION

INVISIBLE LASER RADIATION,
WHEN OPEN AND INTERLOCKS DEFEATED.
AVOID EXPOSURE TO BEAM.

VORSICHT

UNSICHTBARE LASERSTRAHLUNG,
WENN ABDECKUNG GEÖFFNET UND
SICHERHEITSVERRIEGELUNG ÜBERBRÜCKT.
NICHT DEM STRAHL AUSSETZEN.

VARO !

AVATTAESSA JA SUOJALUKITUS
OHITETTAESSA OLET ALTTIINA
NÄKYMÄTTÖMÄLLE LASERSÄTEILYLLE ÄLÄ
KATSO SÄTEESEEN.

ADVARSEL

USYNLIG LASERSTRÅLNING VED ÅBNING, NÅR
SIKKERHEDSBRYDERE ER UDE AF
FUNKTION. UNDGÅ UDSÆTTELSE FOR
STRÅLNING.

VARNING !

ÖSYNLIG LASERSTRÅLNING NÅR DENNA DEL
ÄR ÖPPNAD OCH SPÄRREN ÄR URKOPPLAD.
BETRAKTA EJ STRÅLEN. - STRÅLEN ÄR
FÄRLIG.

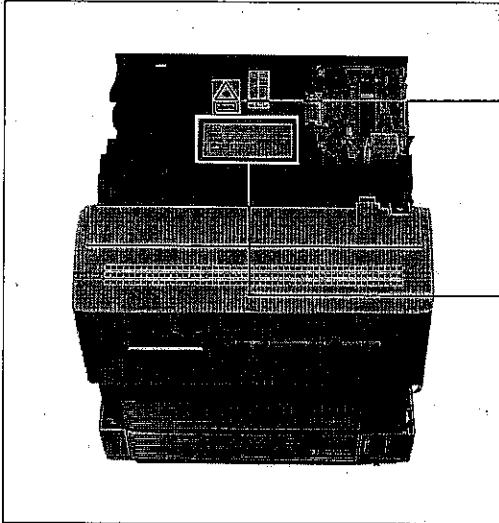
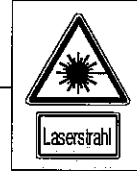
SHARP CORPORATION

This document has been published to be used
for after sales service only.
The contents are subject to change without notice.

At the production line, the output power of the scanner unit is adjusted to 0.57 MILLI-WATT PLUS 20 PCTS and is maintained constant by the operation of the Automatic Power Control (APC). Even if the APC circuit fails in operation for some reason, the maximum output power will only be 15 MILLI-WATT 0.1 MICRO-SEC. Giving an accessible emission level of 42 MICRO-WATT which is still less than the limit of CLASS-1 laser product.

Caution

This product contains a low power laser device. To ensure continued safety do not remove any cover or attempt to gain access to the inside of the product. Refer all servicing to qualified personnel.

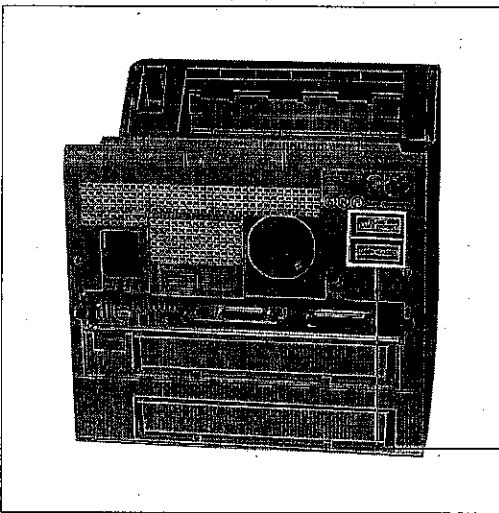


CAUTION
VORSICHT
ADVARSEL
VARNING
VARO!

INVISIBLE LASER RADIATION WHEN OPEN AND INTERLOCKS DEFEATED. AVOID EXPOSURE TO BEAM.
UNSICHTBARE LASERSTRAHLUNG, WENN ABDECKUNG GEÖFFNET UND SICHERHEITSVERRIEGELUNG ÜBERBRÜCKT. NICHT DEM STRAHL AUSSETZEN.
USYNLIG LASERSTRÅLNING VED ÅBNING, NÅR SIKKERHEDSBRYDERE ER UDE AF FUNKTION. UNDGÅ UDSÆTTELSE FOR STRÅLNING.
OSYNLIG LASERSTRÅLNING NÅR DENNA DEL ÄR ÖPPNAD OCH SPÄRREN ÄR URKOPPLAD. BETRÄKTA EJ STRÅLEN-STRÅLEN ÄR FARLIG.
AVÄTTAESSA JA SUOJALUKITUS OHITETTAESSA OLET ALLTIIN NÄKYMÄTTÖMÄLLE LASERSÄTEIL YLLE ÄLÄ KATSO SÄTEESEEN.

VAROITUS! LAITTEEN KÄYTTÄMINEN MUULLA KUIN TÄSSÄ KÄYTTÖOHJEESSA MAINITULLA TAVALLA SAATTAA ALTISTAA KÄYTTÄJÄN TURVALLISUUSLUOKAN 1 YLITTÄVÄLLE NÄKYMÄTTÖMÄLLE LASERSÄTEILYLLE.

VARNING – OM APPARATEN ANVÄNDS PÅ ANNAT SÄTT ÄN I DENNA BRUKSANVISNING SPECIFICERATS, KAN ANVÄNDAREN UTSÄTTAS FÖR OSYNLIG LASERSTRÅLNING, SOM ÖVERSKRIDER GRÄNSEN FÖR LASERKLASS 1.



The foregoing is applicable only to the 220V model, 230V model and 240V model.

LASER KLASSE 1

CLASS 1
LASER PRODUCT

LUOKAN 1 LASERLAITE
KLASS 1 LASERAPPARAT

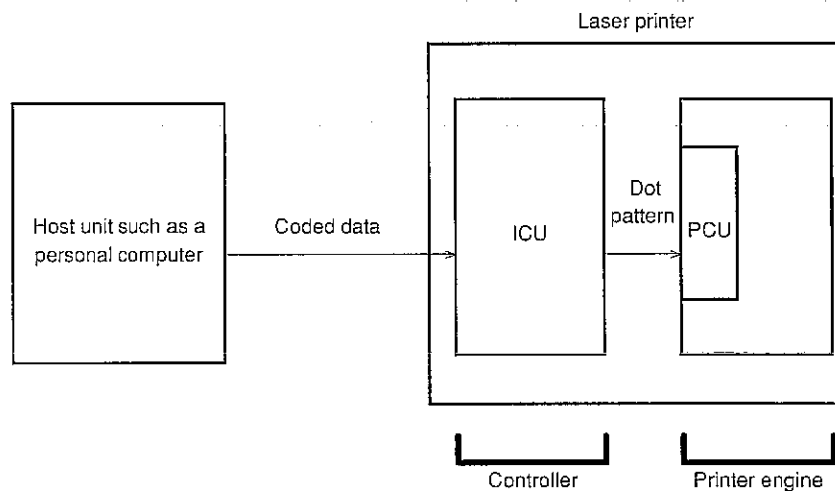
To begin with

The laser printer is used in connection with the host as a personal computer from which the print data is supplied.

The laser printer consists of two major blocks of the controller and the print engine.

The controller consists of the ICU (Interface Control Unit) which is employed to interpret the source print data to create dot pattern information based on the font.

The print engine is the block employed to print the data of the dot pattern information. The print engine includes the laser print mechanism, drum mechanism, and paper feed mechanism which are controlled by PCU (Process Control Unit). Dot pattern information is sent to the laser print block that is controlled by the PCU where the data is converted into laser beams.



This Service Manual describes the printer engine, the PCU (Process Control Unit) which controls the printer engine, and the ICU (Interface Control Unit) which analyzes code data from the host to form dot patterns in this sequence.

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[1] BASIC SPECIFICATIONS

| | |
|-----------------------|---|
| Type: | Desktop |
| Resolution: | 300 dpi + HRT |
| Paper supply method: | Double cassettes (each 250 sheets/80g/m ²) Manual paper supply (single feed) Used for thick papers (60 - 128 g/m ²) and special papers (label paper, OHP) |
| Print speed: | Upper cassette Max. 8 pages/minute Lower cassette Max. 8 pages/minute * However, in this case, the papers of letter size are applied the simple text containing 4,000 characters per page is provided and use prefeed function. |
| First print time: | Less than 16 sec. (paper pass time) * At stand-by mode |
| Paper output: | Face-down tray; 250 pages |
| Warm-up time: | Less than 60 sec. * Standard condition |
| Print process: | Electro-photographic printing method with semiconductor laser diode |
| Charging method: | Saw-tooth charging method |
| Developing method: | Dual components magnetic brush process |
| Drum cleaning method: | Blade cleaning method |
| Fusing method: | Heat roller method Upper side; Teflon coating roller Lower side; Silicon rubber roller |
| Power source: | AC 120, 220/230/240 V 50/60 Hz |
| Power consumption: | Max. 650W (120 V model) Max. 700W (220/230/240 V model) |
| Outside dimensions: | 330(W) x 365(D) x 325(H) mm (13.0" x 14.4 x 12.8") |
| Weight: | Approx. 14.5 kg (32.0 lbs) |
| Noise level: | 48dB maximum (Printing) 40dB maximum (Idle) |
| Emulation: | HP LaserJet III Epson FX-80 IBM Proprinter IBM Graphics Printer PS. Board (option) |
| Interface: | Centronics AppleTalk (option) RS-232C (option) |
| Memory: | Standard 1.0 MB Max. 9.0 MB (with option) |
| Accessories: | Photo-conductor cartridge: one piece Toner/developer cartridge: one piece Heat roller cleaner: one piece Paper cassette: two pieces Power cord: one piece Manual feed guide: one piece Operation manual: one set |
| Supplies: | Photo-conductor cartridge Toner/developer kit (include roller cleaner) |

Options:

| | |
|-------------------|--|
| Paper cassette: | |
| Letter cassette | 250 sheets |
| Legal cassette | 250 sheets |
| A4 cassette | 250 sheets |
| Envelope cassette | 20 sheets |
| Expansion memory: | * 1 MB board 2 MB board 4 MB board |
| Interface board: | * AppleTalk/RS-232C I/F board RS-232C I/F board |

Font card:

| | |
|---------|--------------|
| Bitmap | HP - 9 types |
| Outline | HP - 2 types |

* PS. board:

| | |
|-------------|--------------------------|
| PhoenixPage | include 35 outline fonts |
|-------------|--------------------------|

Programming manual

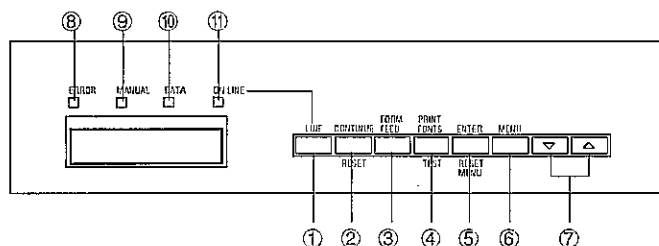
Note: Boards marked with * are standard provisions of the JX-9600PS. (For Europe excluding U.K., only the expansion memory (1MB) and the PS. board are standard provisions.)

[2] OPERATOR PANEL DESCRIPTION

The operation panel is used to set the Laser Printer off-line for direct operations, such as setting the menu items and executing self-tests. Note the following when using the operation panel:

- Set the printer off-line before using the keys.
- Some keys have several functions, which are selected by the duration of time the key is pressed. Be sure to check the functions on the display.

PANEL VIEW



1. Key functions

① LINE key

Used to alternately set the on-line and off-line. Also used to set the printer on-line after performing the self tests or setting the menu items. The laser printer can receive data from the computer when on-line (ON LINE lamp on) and cannot receive data from the computer when off-line (ON LINE lamp-off).

② CONTINUE/RESET key

Used to select the following two functions:

CONTINUE: Clears most errors

Used for the following operations:

- To set the printer on-line from the off-line state after an error.
- To cancel printer self-test and set the printer on-line.
- To set the printer on-line from the menu setting mode.
- To continue printing with the current paper source even when the printer requests a different paper size (or envelope type).

RESET: Resets the Laser Printer to ensure that the panel default settings (the menu settings selected by the user) are available.

Includes the following operation:

- In HP LaserJet series III emulation, temporary soft fonts and temporary macros are cleared.
- Stored page data is cleared.

③ FORM FEED key

Prints data in the print buffer when the printer is off-line. This key is not functional when the printer is on-line.

④ PRINT FONTS/TEST key

Used to select the following three functions:

PRINT FONTS: Prints out available fonts.

SELF TEST #1: Prints the settings of the various menu items.

SELF TEST #2: Starts test pattern printing.

⑤ ENTER/RESET MENU key

Used to select the following two functions:

ENTER: Specifies the menu values to be saved as panel default settings.

RESET MENU: Initializes all items in the Printing Menu to the factory default settings.

Also resets the following:

- In HP LaserJet series III emulation, temporary soft fonts and temporary macros are cleared.
- Stored page data is cleared.

⑥ MENU key

Used to select the following two functions:

PRINTING MENU: Enters the Printing Menu mode. (See [13]-7. MENU SETTING STRUCTURE)

CONFIGURATION MENU: Enter the configuration Menu mode. (See [13]-7. MENU SETTING STRUCTURE)

⑦ Δ and ∇ keys

Used to select values for the menu items. Each time the keys are pressed the menu values change.

2. LED activation and blink conditions

⑧ ERROR lamp (red)

Lights when any error occurs.

⑨ MANUAL lamp (yellow)

Lights when the manual feed mode is selected.

⑩ DATA lamp (yellow)

Lights when the print buffer contains data to print. Blinks if the Laser Printer has waited more than 5 seconds for a form feed command and a partial page remains in the printer buffer.

⑪ ON LINE lamp (green)

Lights when the Laser Printer is set on-line and ready to receive data from the computer. If the LINE key is pressed during printing to set the Laser Printer off-line, this lamp blinks until the page being printed is fed out, indicating that the Laser Printer cannot be set to off-line.

3. 16 digit LCD display

The 16-character liquid crystal display indicates the following:

- Status messages
- Menu settings
- Error conditions
- Service messages

4. Display specification

Error Messages

| Error Message | Description | Recover |
|-------------------------------------|--|---|
| INPUTBUFFER FULL | The host computer ignores the printer's busy state and continues to send data. | Check the protocol signal line between the printer and the host computer or adjust the setting. Press the [CONTINUE/RESET] key. |
| COVER OPEN | Front cover of printer is not closed properly. | Close the front cover firmly and check that it is properly latched. Press the [CONTINUE/RESET] key. |
| INTERFACE ERROR | RS-232C interface error (For example, framing error) | Check the RS-232C interface function and execute it again. Press the [CONTINUE/RESET] key. |
| DATA LOSS ERROR | Too many characters on one line | Delete excess characters and execute again. Press the [CONTINUE/RESET] key. *5 |
| PAPER OUT *** (***) = UPPER, LOWER) | Paper empty or paper cassette removed. | Add paper or replace the paper cassette. If the paper size matches the previous setting, the printer will return online. |
| PAPER JAM | Paper is jammed. | Check the cassette, open the front and top covers, and remove the misfed paper. Press the [CONTINUE/RESET] key. |
| TONER LOW *1 | Near end of toner/developer cartridge life. | Automatically cleared. |
| REPL. TONER *2 | End of toner/developer cartridge life. | Replace the toner/developer cartridge. |
| DRUM NEAR END *3 | Near end of photoconductor cartridge life. | Automatically cleared. |
| REPL. DRUM *4 | End of photoconductor cartridge life. | Replace the photoconductor cartridge. |
| DATA MEMORY FULL | Printer memory cannot accommodate soft fonts or other data included with the print job. May be caused by font rotation, i.e. specifying an orientation different from that of the font card. The user memory is full. Install additional memory, referring to the table in page 104. | First press the [CONTINUE/RESET] key. Then, decrease occupied memory space by decreasing number of soft fonts or eliminating font rotation. When you press the [CONTINUE/RESET] key, the soft font or macro entered prior to going offline is deleted. If you press and hold the [CONTINUE/RESET] key until "RESET" appears on the display, all temporary soft fonts and macros are deleted. |
| EEPROM ERROR | Did you turn off power while setting parameters? Check to see again if the setting is correct. | Press the [CONTINUE/RESET] key and then set the parameters again. |

*1. Conditions for "Toner low"

When one of the following three conditions is satisfied, "Toner low" is displayed.

1. The developer counter (DEV) reaches 29,000.
2. The total of rotating time of the toner motor (DEVTM) reaches 14,900 sec. (Toner equivalent to 14,000 copies of 4% print is consumed.)
3. Toner low level is sensed for 1 min continuously.

*2. Conditions for "REPL toner"

When one of the following three conditions is satisfied, "REPL toner" is displayed.

1. The developer counter (DEV) reaches 30,000.
2. The total of rotating time of the toner motor (DEVTM) reaches 16,000 sec. (Toner equivalent to 15,000 copies of 4% print is consumed.)
3. Toner low level is sensed for 2 min continuously.

*3. Conditions for "DRUM NEAR END"

When one of the following two conditions is satisfied, "DRUM NEAR END" is displayed.

1. The drum counter (DRM) reaches 29,000.
2. The total of rotating time of the toner motor (DRMTM) reaches 30,900 sec. (Toner equivalent to 29,000 copies of 4% print is consumed.)

*4. Conditions for "REPL DRUM"

When one of the following two conditions is satisfied, "REPL DRUM" is displayed.

1. The drum counter (DRM) reaches 30,000.
2. The total of rotating time of the toner motor (DRMTM) reaches 32,000 sec. (Toner equivalent to 30,000 copies of 4% print is consumed.)

*5. In case of data error, set the page protection to A4, letter, or legal.

Service Messages

| Display | Meaning |
|-----------------|-------------------------|
| SERVICE (C1) | Optical System Error |
| SERVICE (C2) | Driving Motor Defective |
| SERVICE (C3) | Polygon Motor Defective |
| SERVICE (C4) | High Heater Temperature |
| SERVICE (C5) | Low Heater Temperature |
| SERVICE (C6) | Thermistor Open |
| SERVICE (C7-C9) | (Reserved) |

| Display | Meaning |
|-----------------|-------------------------------|
| SERVICE (E1) | ICU ROM Checksum Error |
| SERVICE (E2) | ICU RAM Read/Write Error |
| SERVICE (E3) | Expansion Memory Error |
| SERVICE (E4) | ICU Hardware Read/Write Error |
| SERVICE (E5) | EE-PROM Checksum Error |
| SERVICE (E6-E9) | (Reserved) |
| SERVICE (FC) | Font card error |

| Display | Meaning |
|-----------------|-----------------------------|
| SERVICE (P1) | PCU ROM Checksum Error |
| SERVICE (P2) | PCU RAM Read/Write Error |
| SERVICE (P3) | Non-volatile RAM Read Error |
| SERVICE (P4) | Serial Communication Error |
| SERVICE (P5-P6) | (Reserved) |

Menu setting Messages

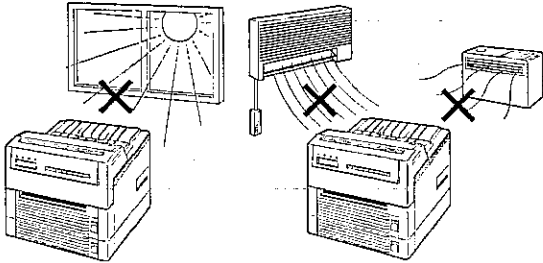
* See [13]-7 Menu setting structure.

[3] UNPACKING AND INSTALLATION

1. Installation requirements

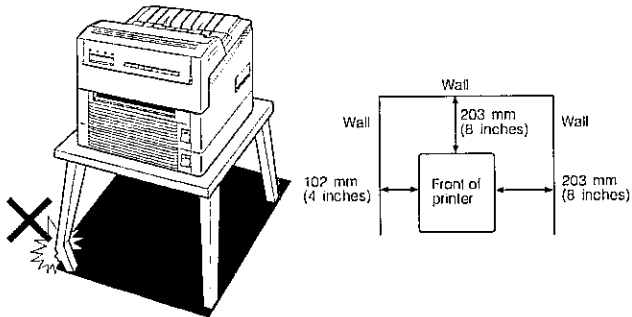
Improper installation may damage the printer. Please note the following during initial installation and whenever the printer has been moved:

- 1-1. Be sure to use the rated voltage from a properly grounded wall outlet only.
- 1-2. Do not install the printer in areas that are:
 - damp or humid,
 - exposed to direct sunlight,
 - extremely dusty or smoky,
 - poorly ventilated,
 - subject to extreme temperature or humidity changes, for example, near an air conditioner or heater.

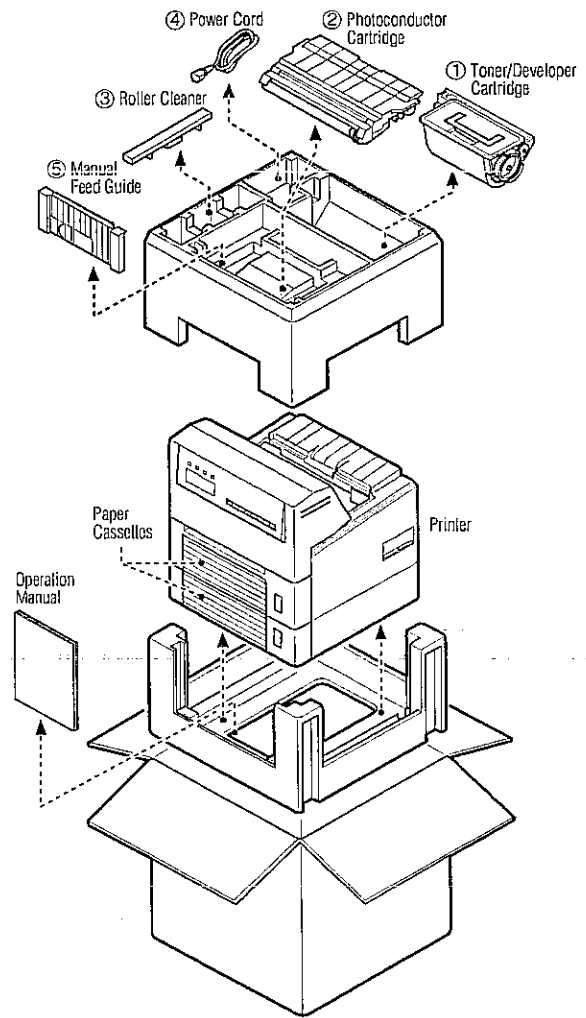


- 1-3. Place the printer on a firm, level table or desk, with enough space to insert the paper cassette and to manually feed the paper.

- 1-4. To ensure proper operation and ventilation, leave at least as much space on each side as shown below.



2. Unpacking



NOTE:

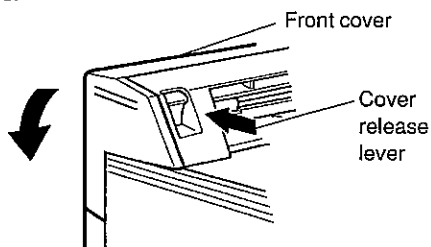
- Save the carton and packing materials. They should be used to repack and protect the printer if it must be shipped for servicing.

3. Setting up

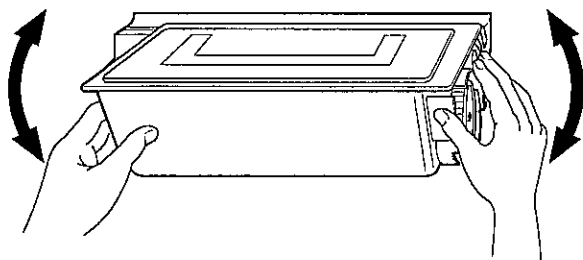
3-1. Installing supplies

3-1-1. Installing the Toner/Developer Cartridge

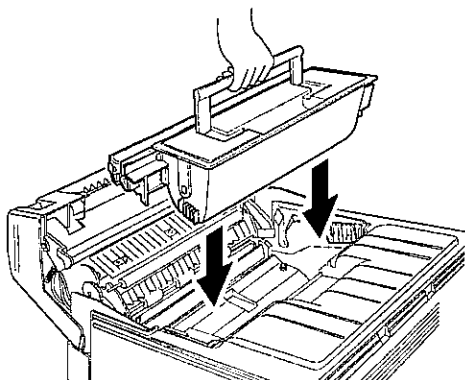
- ① Be sure that the printer is turned off.
- ② Open the front cover.
 - Push the cover release lever and open the front cover by holding both sides.



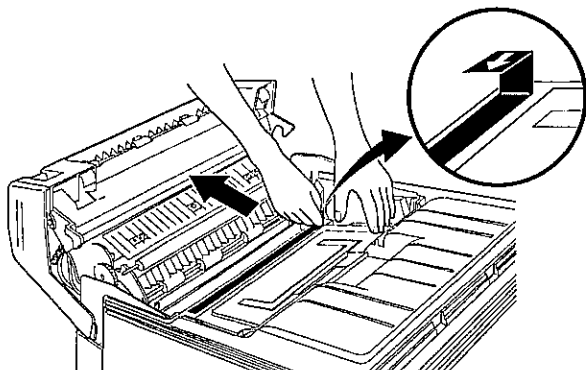
- ③ Remove the toner/developer cartridge from the aluminium bag.
- ④ Shake the toner/developer cartridge vigorously four or five times.



- ⑤ Use the handle to hold the toner/developer cartridge horizontally with the roller to the front side and position it gently. Push the handle down.



- ⑥ Pull the tab to remove the seal.

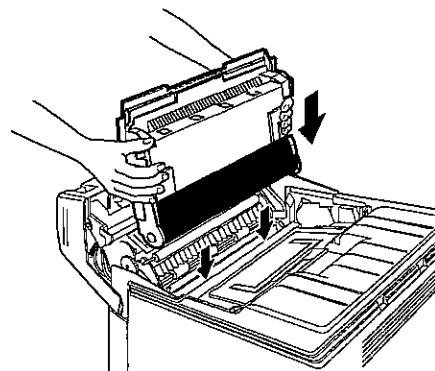


3-1-2. Installing the Photoconductor Cartridge

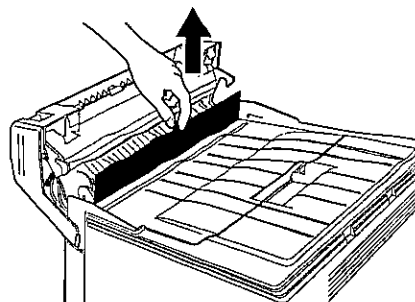
- ① Remove the photoconductor cartridge from the aluminium bag. Do not use a knife to cut the bag.

NOTE:

- When placing the photoconductor cartridge on a desk temporarily before installing, be sure to place it on a level desk. Otherwise, it may be damaged.
 - The new photoconductor cartridge is sealed with a black protective sheet. To prevent damage to the cartridge surface, do not remove the protective sheet until you have positioned the cartridge into place.
- ② Insert the new photoconductor cartridge vertically with the drum down along the frame guides and then place it horizontally until it clicks.



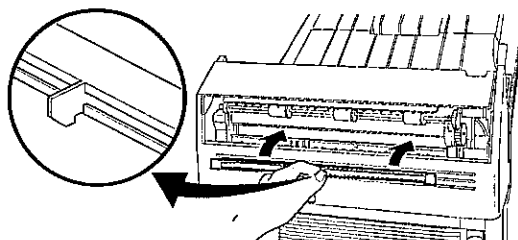
- ③ Remove the protective sheet.



- ④ Place the cartridge horizontally.

3-1-3. Installing the Roller Cleaner

- ① Open the top cover while keeping the front cover open.
- ② Remove the roller cleaner from the plastic bag and install it on the fusing unit.

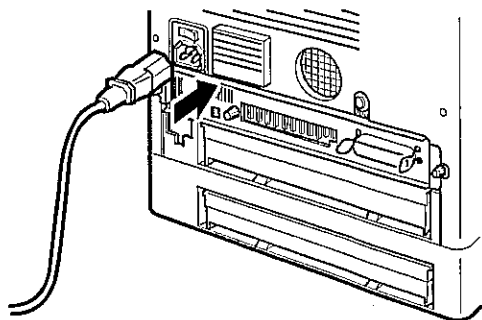


- ③ Close the top cover.
- ④ Close the front cover until it clicks.

3-2. Connecting power cord and interface cable

3-2-1. Power Cord

- ① Be sure the power is turned off.
- ② Plug the power cord into the power cord connector at the back of the printer.



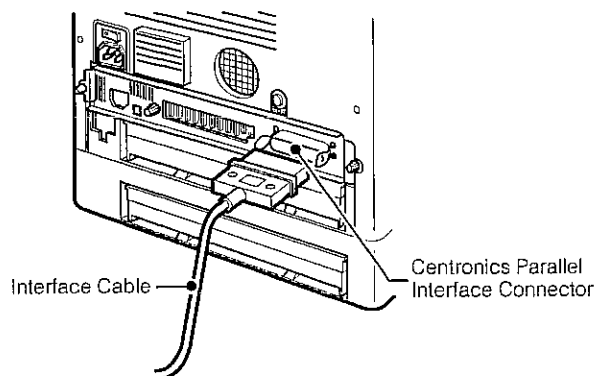
3-2-2. Interface Cable

This Laser Printer is equipped with a Centronics parallel interface.

NOTE:

A shielded, grounded cable and connector are required to comply with either FCC Class B or VDE 0871 and 0875 requirements.

- ① Be sure the power is turned off.
- ② Remove the protective cover from the connector.
- ③ Plug the cable into the connector.

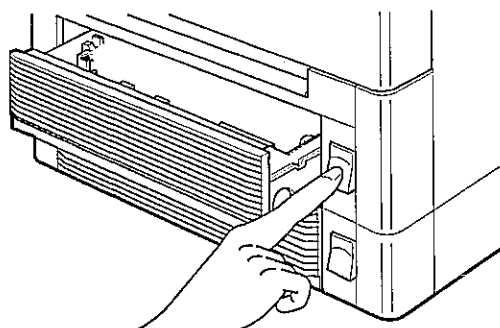


- ④ Fasten the bail clips for the parallel connector.

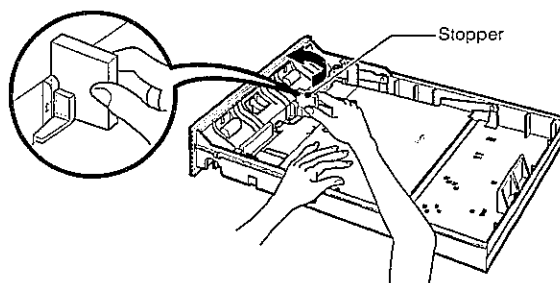
3-3. Loading paper

3-3-1. When using the paper cassette for the first time:

- ① Press the cassette eject button to take out the paper cassette.



- ② Remove the stopper by pressing it with your thumb and rotating it as shown below while holding the pressure plate securely with your other hand.

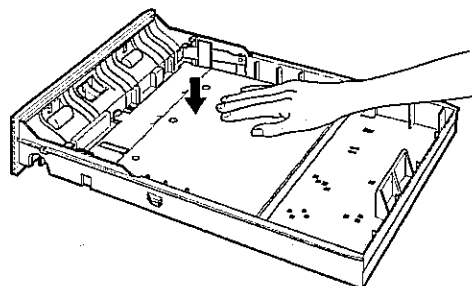


NOTE:

Save the stopper since this should be used to protect the cassette if it must be transported.

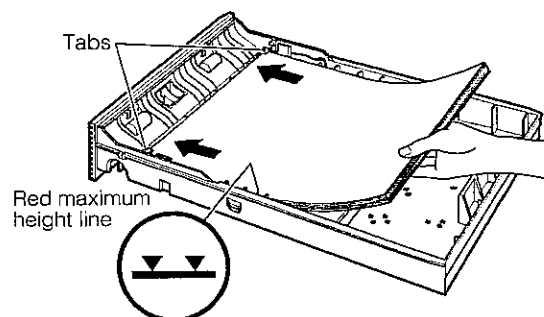
3-3-2. Loading paper:

- ① Push the pressure plate down until it locks in position.

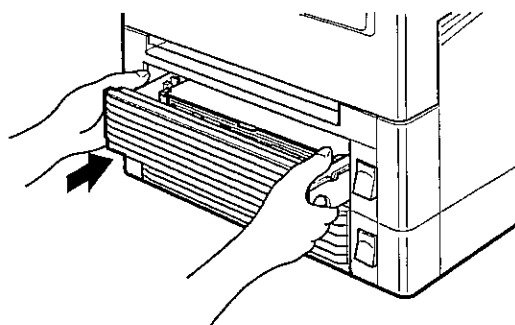


- ② Place the paper in the cassette with the corners under the metal corner tabs. Remove some paper if the paper is tight under the metal corner tabs. Shake the paper cassette gently to straighten the paper.

- Note that the side facing up is the printing side.
- Do not load paper above the red maximum height line, or paper may misfeed.



- ③ Slide the paper cassette into the printer until it locks into place.

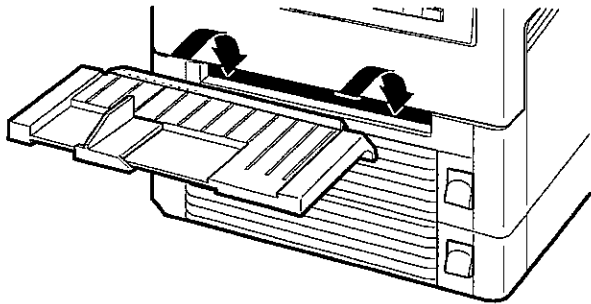


NOTE:

- When using the lower cassette, be sure to install the upper cassette because paper in the lower cassette passes through the upper cassette.
- Do not apply oil to the roller of the cassette.

3-3-3. Setting the manual feed guide

Insert the Manual Feed Guide into the Manual Feed Slot from an angle, put the claws in place, and then position the Manual Feed Guide horizontally.



3-4. Selecting a language

The messages shown on the display, font printout, and SELF TEST #1 printout can be selected from five different languages: English, French, German, Italian, and Spanish. English is the default setting. If you want to select another language, follow the procedure below.

- ① Press the **LINE** key to set the printer offline.
- ② Press and hold the **MENU** key until "I/F=PARALLEL*" appears on the display.
- ③ Press the **MENU** key several times until "MESSAGE=ENGLISH*" appears on the display.
- ④ Press the Δ or ∇ key to select the desired language:
 ENGLISH
 FRENCH
 GERMAN
 ITALIAN
 SPANISH
- ⑤ Press the **ENTER/RESET/MENU** key.
 - An asterisk (*) appears on the right side of the display.
- ⑥ Press the **LINE** key once so that "READY [LJ3]UP" appears on the display to save the setting and the ON LINE lamp lights.
- ⑦ When all the settings are completed, perform SELF-TEST #1 before printing to confirm the selected values.

NOTE:

In the following pages, all messages, font printouts, and SELF-TEST #1 printouts are shown in English.

3-5. Performing self-tests

After you have performed all the installation procedures, we recommend that you perform the self-tests to ensure that the printer is working properly. There are two self-tests: SELF TEST #1 and SELF TEST #2.

SELF TEST #1 produces a printout showing current printing and configuration menu settings, and other information about the printer's current status.

SELF TEST #2 prints an entire sheet of characters in a test pattern using the internal character set.

Before you perform these tests, check the following:

- Toner/developer cartridge, photoconductor cartridge, and roller cleaner have been installed.
 - Paper cassette is loaded with paper.
 - Printer is connected to a power outlet.
- (A computer is not required for these tests.)

NOTE:

When you perform a self-test, be sure to use A4, Letter, or Legal size paper. If you use any other types of paper, only a part of the print area will be printed on the sheet.

3-5-1. Entering the Self-Test Mode

1. Press the power switch to turn on the printer.
 - "SELF TEST" appears on the display.
 - The ON LINE lamp lights, and "READY [LJ3]UP" appears on the display. In about 60 seconds, "READY" stops blinking.
2. Press the **LINE** key to set the printer offline.
 - The ON LINE lamp turns off.
 - "READY" appears on the display.

3-5-2. Self-Test #1

1. Press and hold the **PRINT FONTS/TEST** key until the display shows "SELF TEST #1".
 - The DATA lamp lights and printing begins.
 - A printed sheet similar to the sample shown below is output.
 - When printing is complete, the DATA lamp turns off and "READY" appears on the display.

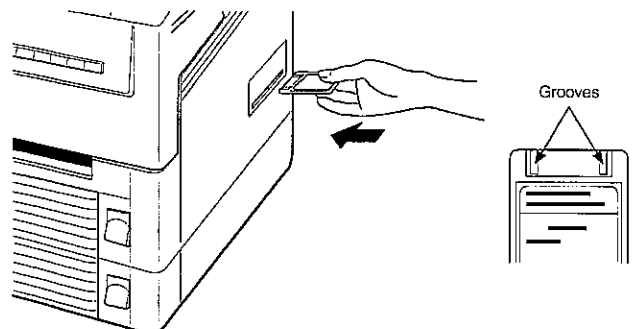
3-5-3. Self-Test #2

1. Press and hold the **PRINT FONTS/TEST** key until the display shows "SELF TEST #2".
 - The DATA lamp lights and printing begins.
 - The printed test pattern is output, and the DATA lamp turns off.
 - Check that the printout is similar to the sample shown below.

4. Installing options

4-1. Font Cards

Credit card sized font cards are available as options, and provide fonts that are not supplied with the printer. See Options, page 86. To use a font card, insert it face up into one of the font card slots (A or B) located on the right side of the printer. Insert the end with the two grooves into the printer first.



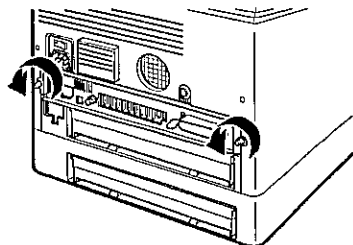
CAUTION

Be sure to insert or remove the font card while the ON LINE lamp and the DATA lamp are off. Inserting or removing the font card while these lamps are either lit or blinking may result in erratic printing or hardware errors.

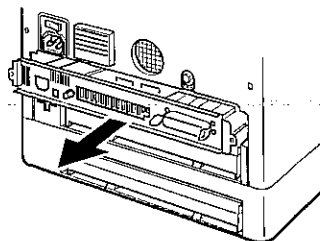
4-2. Expansion Memory, PostScript, and Interface Boards

Before installing each of these boards, perform steps ①, ②, and ③. After installing each board, perform step ④.

- ① Turn off the power switch and remove the power cord. Remove font cards if installed. Remove the interface cable if installed.
- ② Remove the left and right thumbscrews that hold the controller board in place by turning them counterclockwise. Do not remove the central thumbscrew in this step.



- ③ Carefully pull the controller board completely out of the printer by using the central thumbscrew and the bail clips for the connector on the front face.



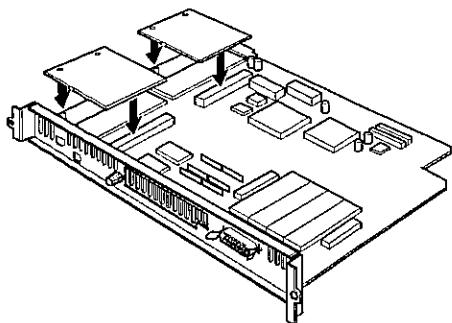
- ④ Replace the central thumbscrew. Install the controller board into the printer by pushing the controller board gently along the guide rails in the slot and replace the left and right thumbscrews.

NOTE:

When you complete the installation of each board, perform Self-Test #1 to check operation.

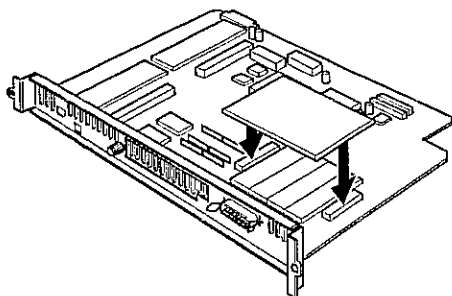
Expansion Memory Board:

Remove the expansion memory board from its package. Insert the memory board from the top down by putting the two holes to the projections on the controller board. The board can be installed on any unoccupied space.



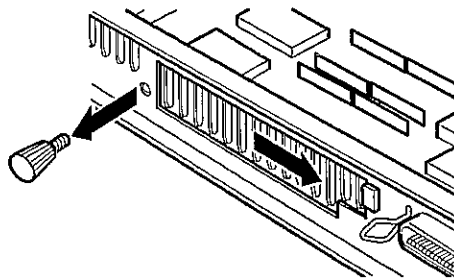
PostScript Board:

Remove the PostScript board from its package. Insert this board as shown in the figure.

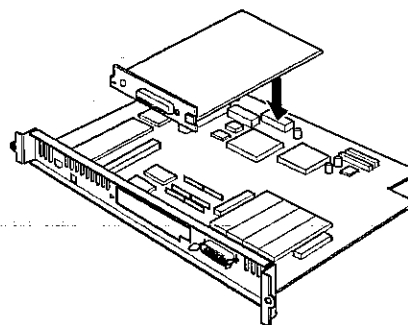


Interface Board:

1. Remove the interface board from its package. Remove the front plate of the controller board by removing the central thumbscrew, sliding the plate to the right, and then lifting the left end of the plate while pressing it a little to the right.



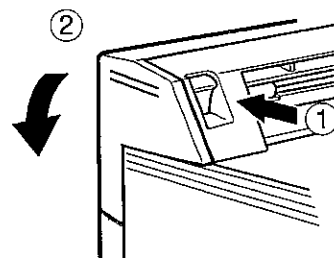
2. Insert the interface board into the opening and insert the bottom connector to the controller board as shown in the figure below. If not installing the interface board, do not remove the front plate.



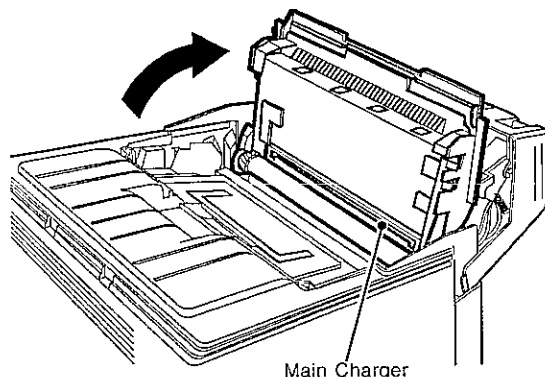
5. Others

5-1. Cleaning the Main Charger

- ① Turn off the power.
- ② Open the front cover.
 - Push the cover release lever (①) and open the cover by holding both sides (②).

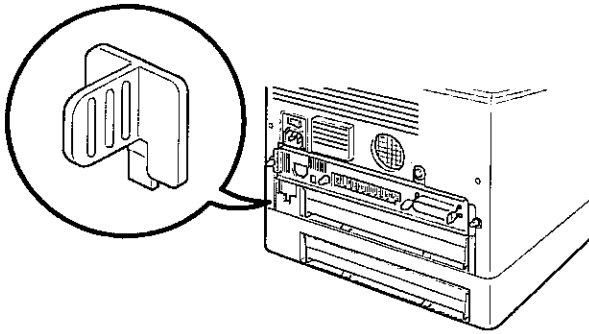


- ③ Position the photoconductor cartridge vertically.
 - Insert your hand into the opening between the face down tray and the photoconductor cartridge. Push the lever at the back of the photoconductor cartridge with your fingers and then rotate the cartridge until the cartridge is positioned vertically. The main charger exists near the drum.

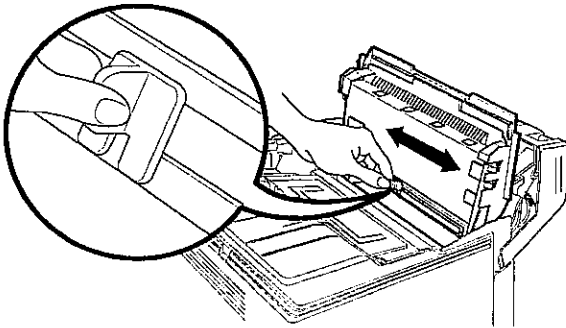


Main Charger

- ④ Remove the charger cleaner from the rear cover.



- ⑤ Insert the charger cleaner into the main charger and clean the metal plate by sliding the cleaner as shown below.



NOTE:

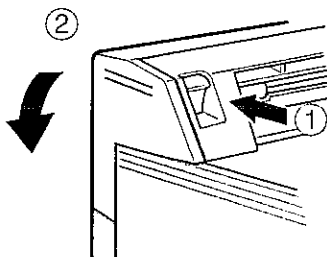
- Do not pull out the cleaner halfway on the metal plate. Be sure to end at either the left or the right end on the plate.

- ⑥ Replace the charger cleaner on the rear cover.
 ⑦ Close the photoconductor cartridge until it clicks.
 ⑧ Close the front cover.
 ⑨ Turn on the power.

5-2. Shipping instructions

Follow the procedure below whenever transporting or shipping the printer.

- ① Open the front cover.
- Push the cover release lever (①) and open the cover by holding both sides (②).

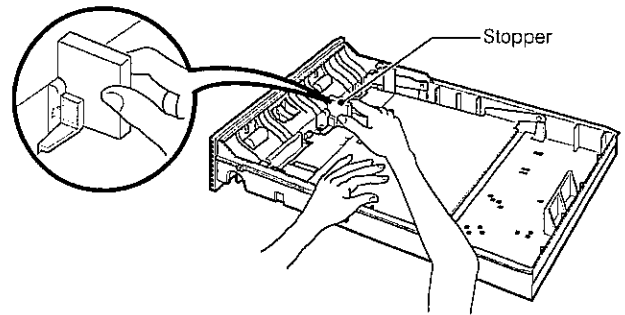


- ② Remove the photoconductor cartridge and the toner/developer cartridge.

NOTE:

Any time the photoconductor cartridge is removed from the printer, it must be placed in a bag which does not allow the photoconductor cartridge to be exposed to light. This is required to prevent the photoconductor from being overexposed to ambient light.

- ③ Remove the paper from the paper cassette and secure the pressure plate with the stopper so that the node of the stopper is inserted into the hole of the cassette front side and the claw of the stopper engages with the pressure plate. Replace the paper cassette.



- ④ Close the front cover.
 ⑤ Pack the printer, reversing the order of the UNPACKING instructions.

NOTE:

- When returning the printer for servicing, include:
 - A) A written explanation of the problem encountered.
 - B) Any print samples which may help in diagnosing the problem.
- Do not include toner/developer cartridge or photoconductor cartridge unless specifically requested by SHARP.

[4] SUPPLIES

1. Kinds of papers

Standard Papers

- Automatic Feeding from the Paper Cassette

| Sizes | A4 | Letter | Legal |
|-------|--------------|--------------|--------------|
| | 210 x 297 mm | 8-1/2" x 11" | 8-1/2" x 14" |

Weights

| | | |
|--------------------------------|---|--------------------------------|
| 60 g/m ² 16 lbs. | ↔ | 80 g/m ² 21 lbs. |
|--------------------------------|---|--------------------------------|

- The A4 size cassette is a standard accessory on the printer. Cassettes in other sizes are available as options.

Manual Feeding

| Sizes | Max. paper size: | Max. width | 216 mm (8-1/2") |
|-------|------------------|-------------|-----------------|
| | | Max. length | 356 mm (14") |
| | Min. paper size: | Min. width | 98 mm (3-7/8") |
| | | Min. length | 190 mm (7-1/2") |

Weights

| | | |
|--------------------------------|---|---------------------------------|
| 60 g/m ² 16 lbs. | ↔ | 128 g/m ² 34 lbs. |
|--------------------------------|---|---------------------------------|

- 210 x 297 mm (A4) is the maximum size for paper weighing more than 105 g/m² (28 lbs.).

Envelopes

Sizes

| | |
|--|----------------------------------|
| International DL 110 x 220 mm | International C5 162 x 229 mm |
| Commercial 10 (Business) 4-1/8" x 9-1/2" | Monarch 3-7/8" x 7-1/2" |

Weights

| | | |
|--------------------------------|---|--------------------------------|
| 60 g/m ² 16 lbs. | ↔ | 90 g/m ² 24 lbs. |
|--------------------------------|---|--------------------------------|

- An optional envelope cassette is available for continuous feeding of up to 20 envelopes.
- Do not use envelopes with metal tabs, snaps, windows, strings, or other attachments, which may damage the printer.

Special Papers (manual feed only)

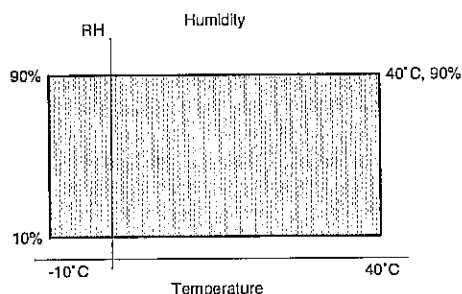
| Sizes | Transparency film (manual feed only) | A4 210 x 297 mm | Letter 8-1/2" x 11" |
|-------|---|--------------------|------------------------|
|-------|---|--------------------|------------------------|

- Be sure to use only transparency films and labels that are recommended by SHARP.

2. Photo-conductor cartridge, developer/toner cartridge

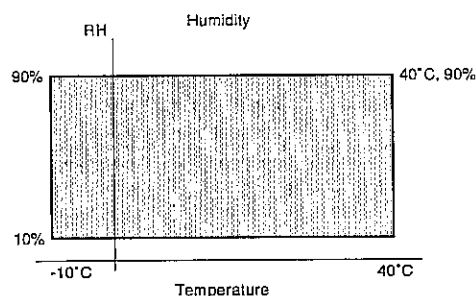
| Name | Product name | Pcs/pack | Life | Note |
|---|--------------|----------|--|--|
| Photo-conductor cartridge (with W.T.B) | JX-96DR | 5 | 30,000 pages (A4 or LT 4% black image area) | |
| Toner/developer cartridge with roller cleaner | JX-96DC | 5 | 15,000 pages (A4 or LT 4% black image area) | All destinations except for USA and CANADA |
| | JX-96ND | 5 | 30,000 pages (MAX) | USA, CANADA only |

Storage condition



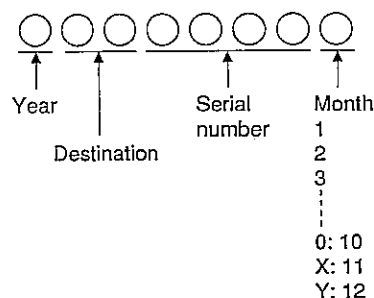
- * Storage period
24 month after the production month (not-unpacked and storage condition)

Transport condition



Lot number identification

Photo-conductor cartridge and Toner/developer cartridge



[5] OUTLOOK AND INTERNAL STRUCTURE

1. Outlook

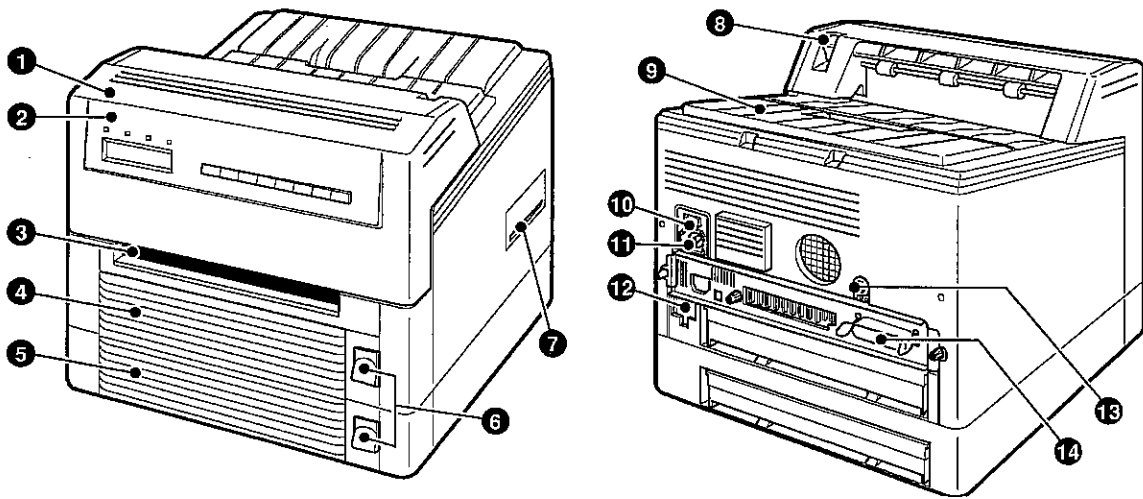


Fig. 5-1

| PART NAME | DESCRIPTION |
|---|---|
| ❶ Front Cover | |
| ❷ Operation Panel | Include the indicator lamps, operation keys, and display. |
| ❸ Manual Feed Slot | Accepts the manual feed guide for feeding special papers, envelopes, and paper not in the cassette. |
| ❹ Upper Paper Cassette | Holds up to 250 sheets of paper. |
| ❺ Lower Paper Cassette | Holds up to 250 sheets of paper. |
| ❻ Cassette Eject Buttons | Press to eject paper cassette. |
| ❼ Font Card Slots (A, B) | Accept optional font cards for additional font selection. |
| ❽ Cover Release Lever | Push to open the front cover. |
| ❾ Face Down Tray | Collects the printed paper face down. |
| ❿ Power Switch | Press to turn the printer power on and off. |
| ⓫ Power Cord Connector | |
| ⓬ Charger Cleaner | The charger cleaner is used for maintenance. (See [3]-5-1.) |
| ⓭ Print Density Adjuster | To increase print density, rotate this clockwise. |
| ⓮ Centronics Parallel Interface Connector | |

2. Open view

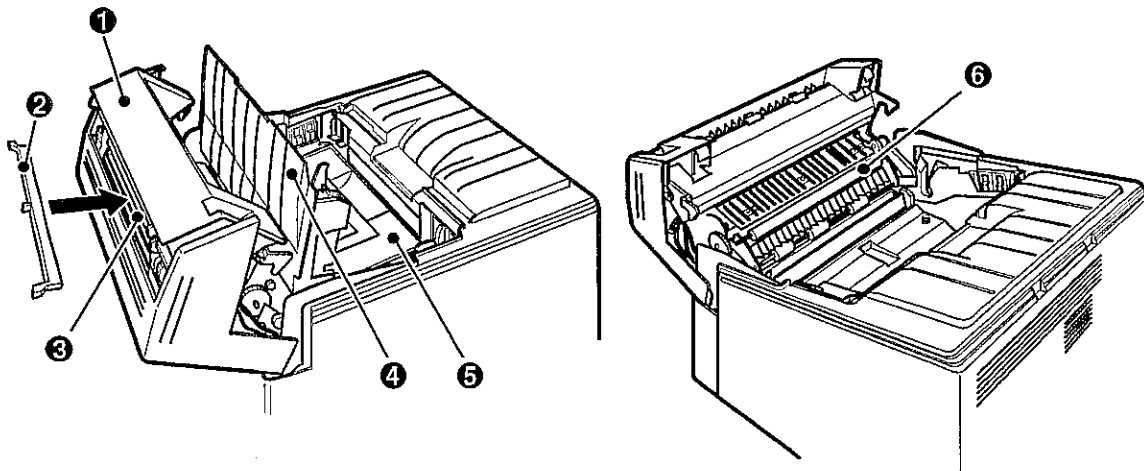
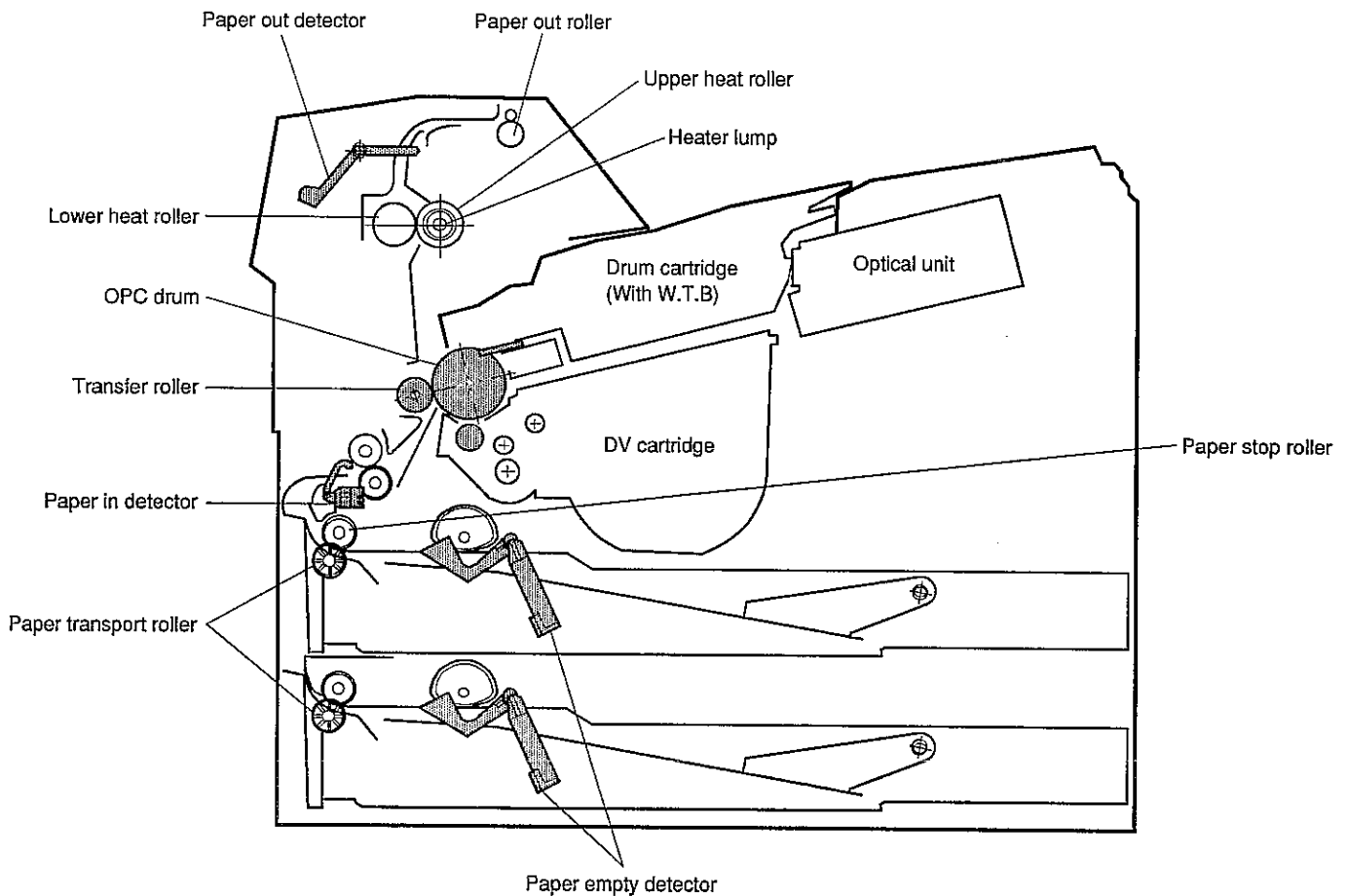


Fig. 5-2

| PART NAME | DESCRIPTION |
|-----------------------------|--|
| ❶ Front Cover | Open to check for misfed paper. |
| ❷ Roller Cleaner | Before the printer is used for the first time, install the roller cleaner on the top of the fusing unit. |
| ❸ Fusing Unit | Nicrome wire is used in the heater lamp. |
| ❹ Photoconductor Cartridge | Supply item |
| ❺ Toner/Developer Cartridge | Supply item |
| ❻ Transfer Roller | _____ |

3. CROSS section



4. SWITCH, SENSOR, Detector

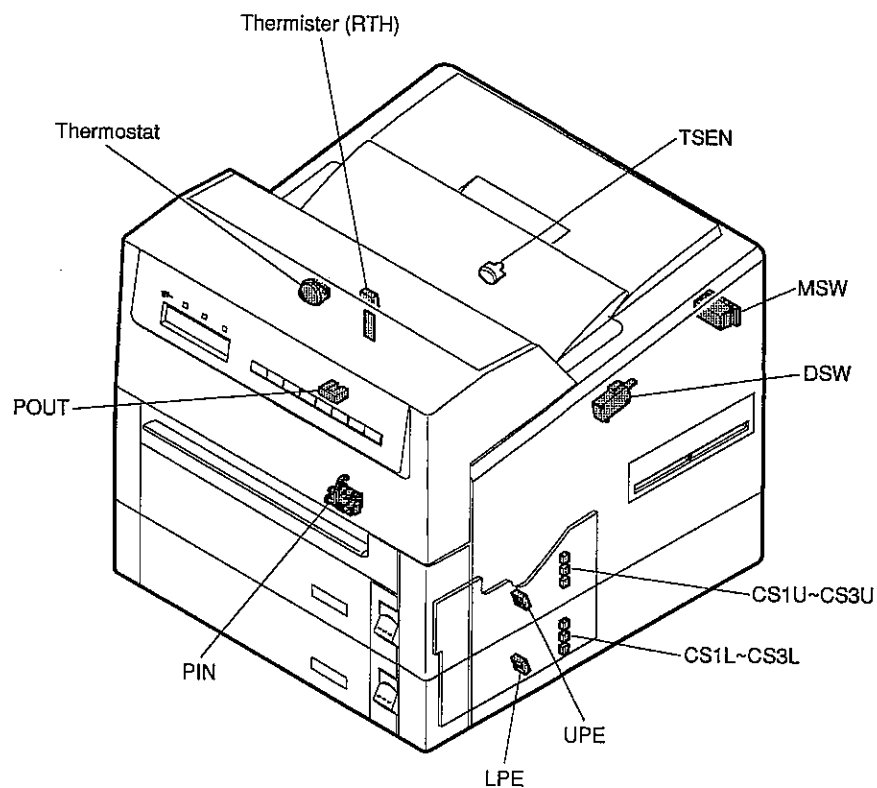


Fig. 5-4

| Name | Function | Type |
|-------------|--|-----------------|
| PIN | Paper in detector | Reed switch |
| POUT | Paper out detector | Photo sensor |
| UPE | Upper cassette empty detector | Reed switch |
| LPE | Lower cassette empty detector | Reed switch |
| CS1U ~ CS3U | Upper cassette size detector | Push switch |
| CS1L ~ CS3L | Lower cassette size detector | Push switch |
| MSW | MAIN SWITCH (Power SW) | --- |
| DSW | Front cover open detector (24V, 5V line safety switch) | Micro switch |
| TSEN | Toner control sensor | Magnetic sensor |
| RTH | Heat roller surface tempture sensor thermistor | Thermistor |
| THERMOSTAT | | Thermostat |

5. MOTOR, solenoid, clutch

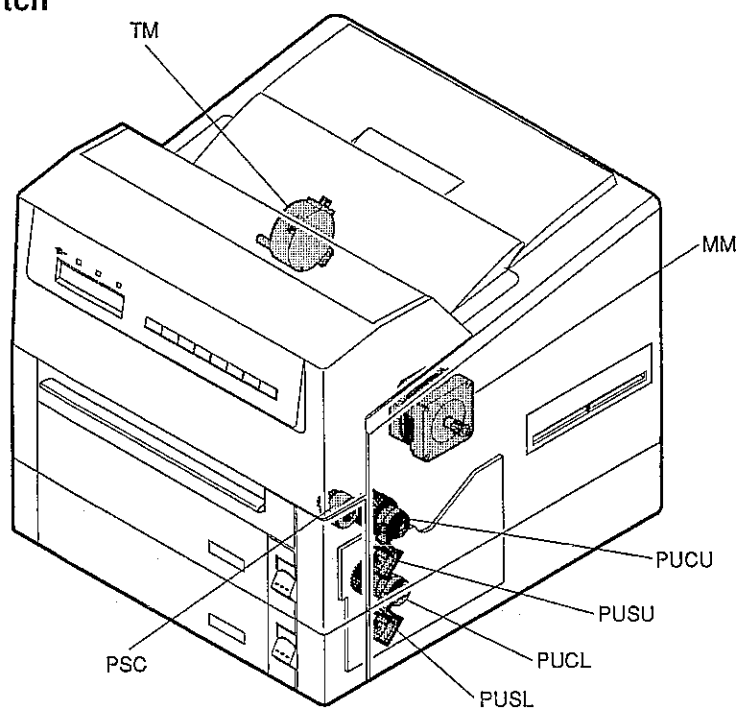


Fig. 5-5

| Name | Function | Type |
|------|-------------------------------|----------------------------|
| MM | Main motor | Stepping motor |
| TM | Toner motor | AC motor |
| PSC | Paper stop (resist) clutch | Electrical magnetic clutch |
| PUSL | Lower pick up roller solenoid | Solenoid |
| PUSU | Upper pick up roller solenoid | Solenoid |
| PUCL | Lower pick up clutch | Spring clutch |
| PUCU | Upper pick up clutch | Spring clutch |

6. P.W.B

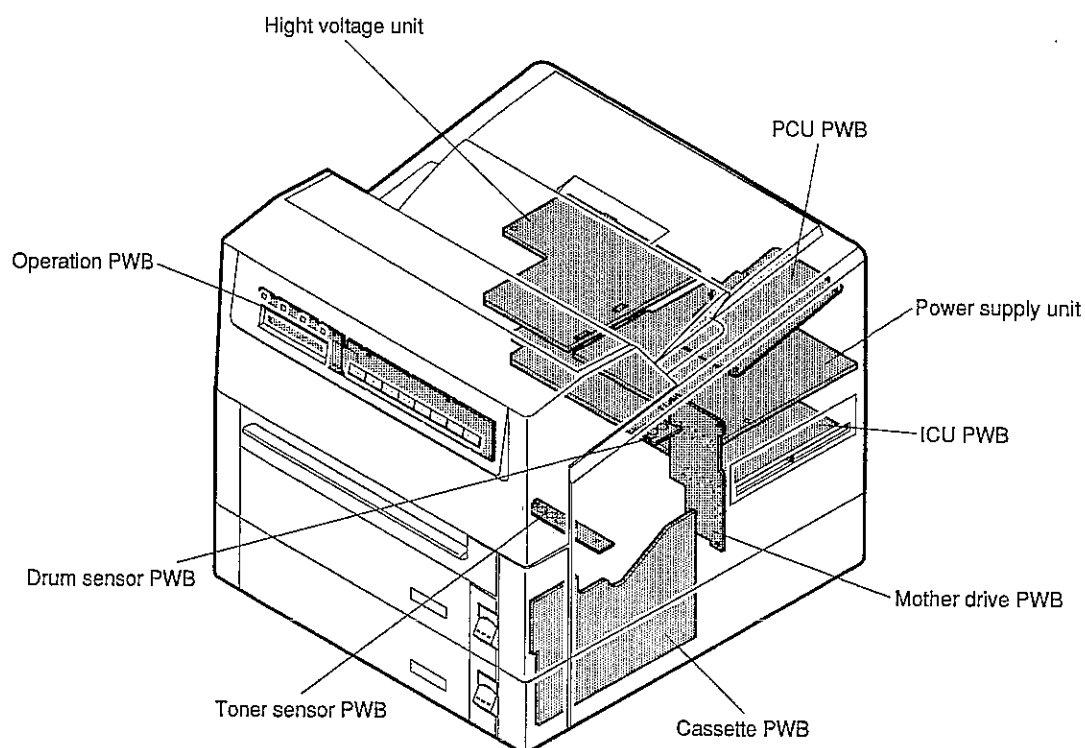
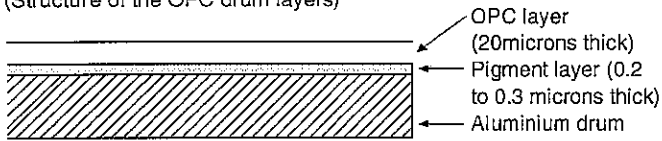


Fig. 5-6

[6] PRINT PROCESS

An OPC drum is used for the photoconductor.
(Structure of the OPC drum layers)



1. Functional diagram

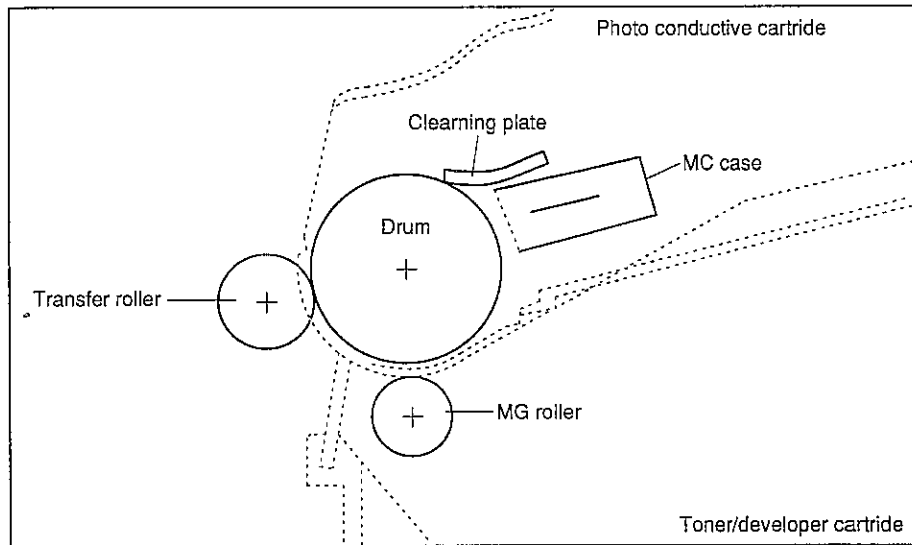


Fig. 6-1

(Basic operation cycle)

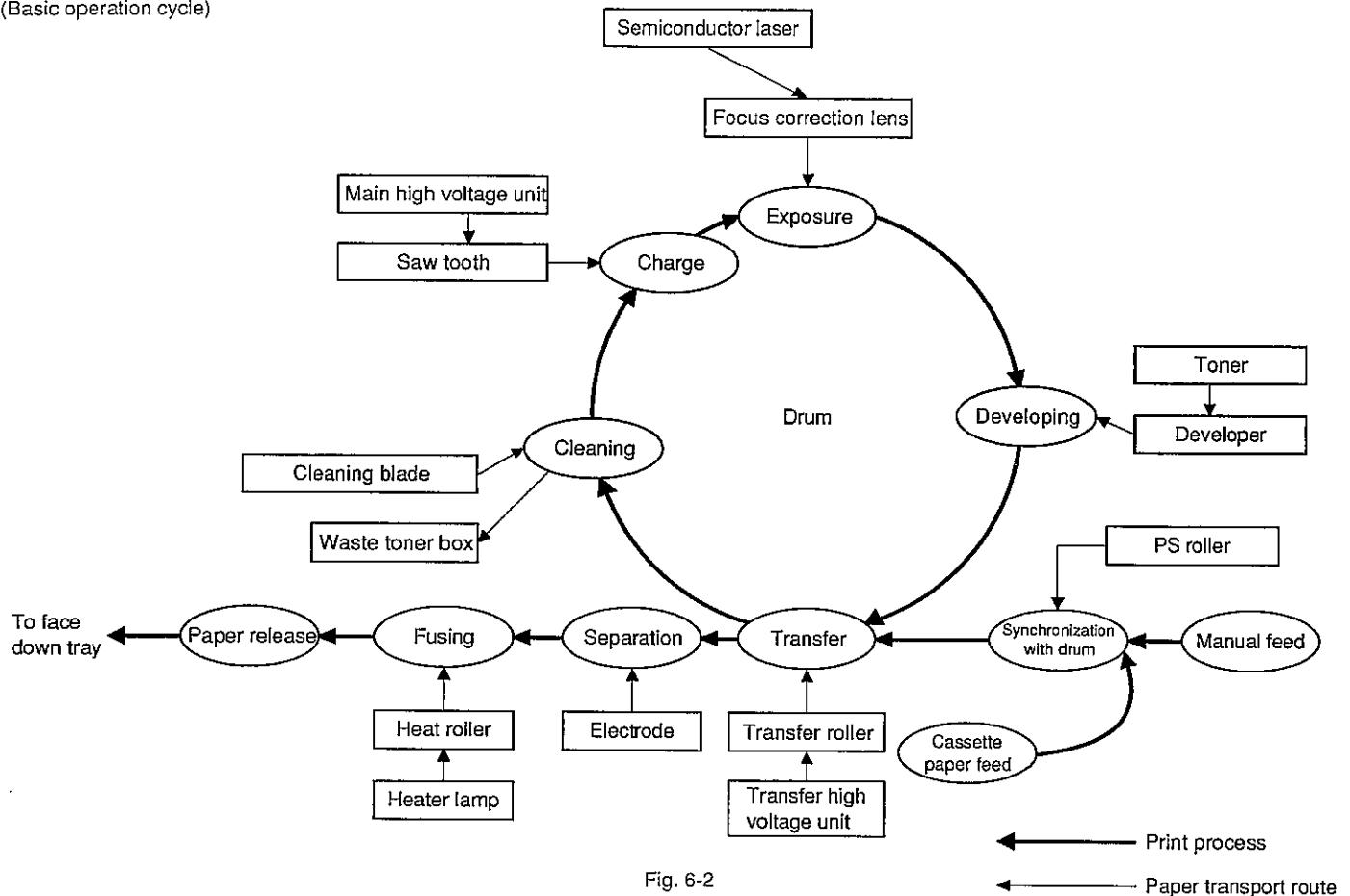


Fig. 6-2

2. Image forming process steps

This printer is a non-impact printer that uses the semiconductor laser and electrostatic print process and uses an OPC (Organic Photo Conductor) for its photoconductive material. First, corona from the main corona unit charges the drum surface and a latent image is formed on the drum surface using a laser beam. This latent image forms a visible image on the drum surface with toner. The toner image is then transferred onto the print paper by the transfer roller and fixed on the print paper using the fuser roller, and pressure.

- Step-1: Charge**
 Step-1: Charge
 Step-2: Exposure
 Latent image is formed on the drum.
- Step-2: Exposure**
- Step-3: Developing**
 Latent image formed on the drum is then changed into visible image with toner.
- Step-4: Transfer**
 The visible image (toner image) on the drum is transferred onto the print paper.
- Step-5: Cleaning**
 Residual toner on the drum surface is collected by the cleaning blade.
- Step-6: Optical discharge**
 Residual charge on the drum surface is removed, by semiconductor laser beam.

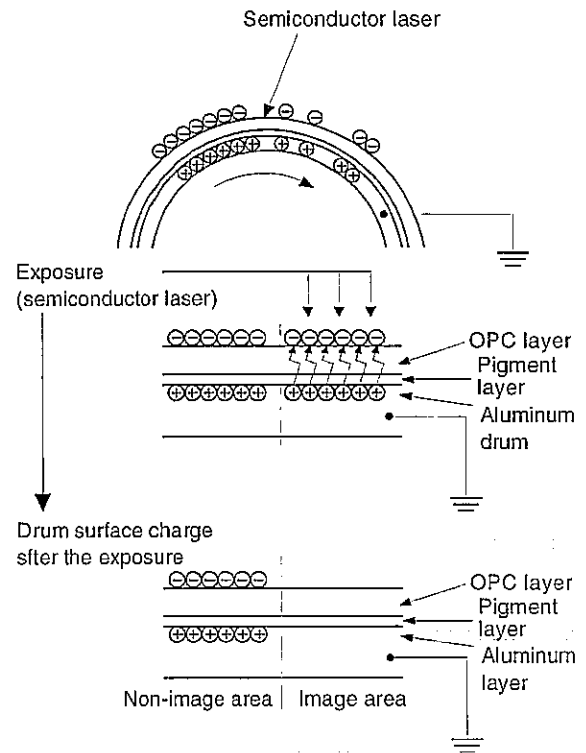


Fig. 6-4

3. Basic print process

Step-1: DC charge

A uniform negative charge is applied over the OPC drum surface by the main charging unit. Stable potential is maintained by means of the Scrotron charger.

Positive charges are generated in the aluminum layer.

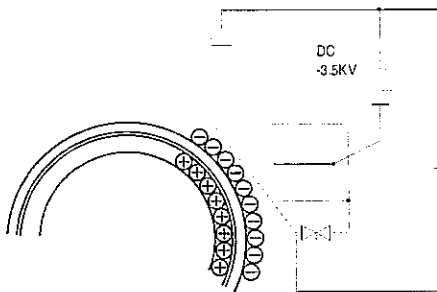


Fig. 6-3

Step-2: Exposure (laser beam, lens)

A Laser beam is generated from the semiconductor laser with the print pattern signal. It is exposed onto the OPC drum surface through the porigon mirrors and lens. The resistance of the OPC layer decreases for an area exposed by the laser beam (corresponding to the print pattern signal). The beam neutralizes the negative charge. The electrostatic latent image is formed on the drum surface.

Step-3: Developing (DC bias)

A bias potential is applied to the MG roller in the two component magnetic brush developing method, and the toner is charged negative through friction with the carrier.

Non-image area of the drum surface charged with negative potential repel the toner, whereas the bright exposed portions where there are no negative charges exist are developed by the toner. As a result, a visible image appears on the drum surface.

- ⊕ : Carrier (Magnetized particle)
- : Toner (Charge negative by friction)
- (N) (S) : Permanent magnet (provided in three locations)

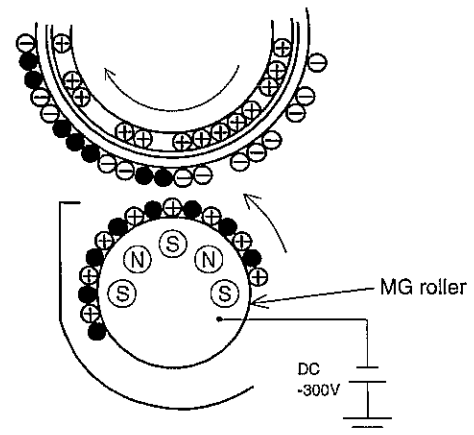


Fig. 6-5

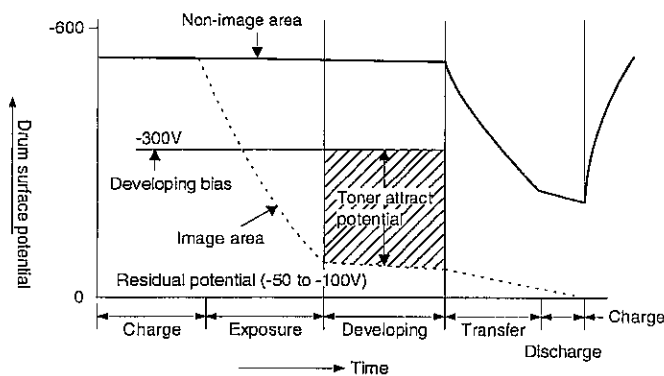


Fig. 6-6

Toner is attracted over the shadowed area because of the developing bias.

Step-4: Transfer

The visible image on the drum surface is transferred onto the print paper by applying a positive charge from the transfer roller to the back of the print paper.

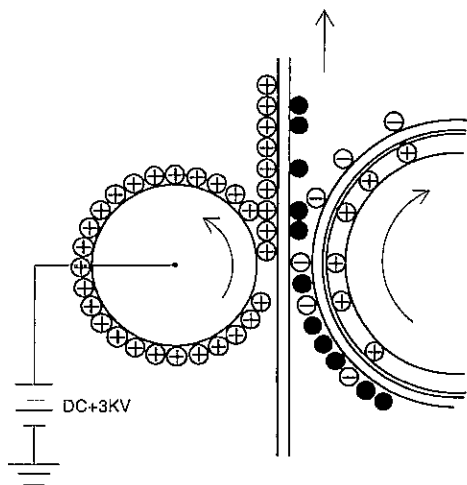


Fig. 6-7

Step-5: Separation

Since the separation electrode is grounded, the print paper charged positively by transfer is discharged to be separated.

Step-6: Cleaning

Toner remaining on the drum is collected by the cleaner blade and transported to the waste toner collecting section in the cleaning unit, by the waste toner transport roller.

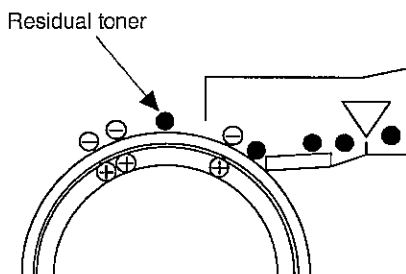


Fig. 6-8

Step-7: Optical discharge (Semiconductor laser)

Before the drum rotation is stopped, semiconductor laser is radiated onto the drum to reduce the electrical resistance in the OPC layer and eliminate residual charge, providing a uniform state to the drum surface.

When the electrical resistance is reduced, positive charges on the aluminum layer are moved and neutralized with negative charges on the OPC layer.

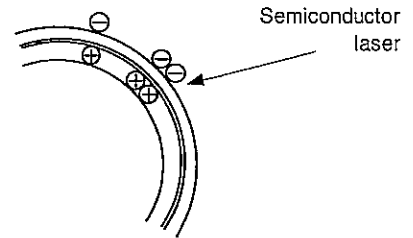


Fig. 6-9

Charge by the Scorotron charger

Function

The Scorotron charger functions to maintain the surface potential of the drum even at all times which can be used to control the surface potential regardless of the charge characteristics of the photoconductor.

Basic function

A screen grid is provided between the saw tooth and the photoconductor, a stable voltage is added to the grid to apply the corona current to the photoconductor and the grid.

As the photoconductor is charged by the corona from the main corona unit, the surface potential increases. This increases the current flowing through the screen grid. When the photoconductor potential nears the grid potential, the entire current turns to flow to the grid so that the photoconductor potential can be maintained at a stable level.

Process controlling

Function

Print pattern signal is converted into a visible image by the semiconductor laser using negative to positive (reversible) developing method. Therefore, if the developing bias is added before the drum is charged, toner is attracted onto the drum. If the developing bias is not added when the drum is charged, the carrier is attracted to the drum because of the strong electrostatic force of the drum.

To avoid this, the process is controlled by adjusting the drum potential and the grid potential of the Scorotron charger.

Basic function

Voltage added to the screen grid can be selected, high and low.

To make it easily understood, the figure below shows voltage transition at the developer unit.

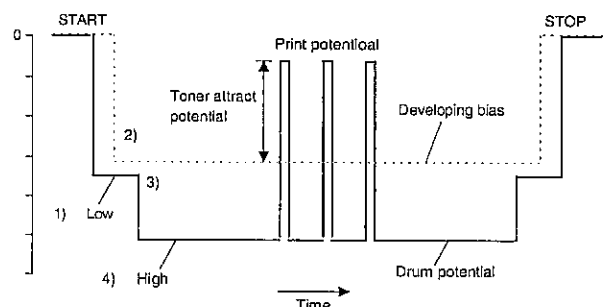


Fig. 6-10

Start

- 1) Because the grid potential is at a low level, the drum potential is at about -250V . (Carrier may not be attracted though the carrier is pulled towards the drum by the electrostatic force of -250V .)
- 2) Developing bias (-300V) is applied when the photoconductor potential is switched from LOW to HIGH.
- 3) Though developing bias (-300V) is applied, since the photoconductor potential rises to HIGH, toner is not attached.

Stop

The reverse sequence takes place.

Retaining developing bias at an abnormal occurrence**Function**

The developing bias will be lost if the power supply was shut off during printing due to a power supply failure. In this event, the drum potential slightly abates and the carrier makes deposits on the drum because of strong static power. To prevent this, the machine incorporates the function to retain the developing bias for a certain period against a possible power supply failure.

Basic function

Normally, the developing bias voltage is retained for a certain time before the drum comes to a complete stop, if the machine should stop before completing the normal print cycle. In this way, the developing bias can be added before resuming the operation after an abnormal interruption. No carrier will therefore make a deposit on the drum surface.

[7] OPERATIONAL DESCRIPTION

The engine block is composed of the following sections.

1. Paper feed and transport section
2. Print process section (Refer to [6] PRINT PROCESS.)
3. Fusing section
4. Optical section

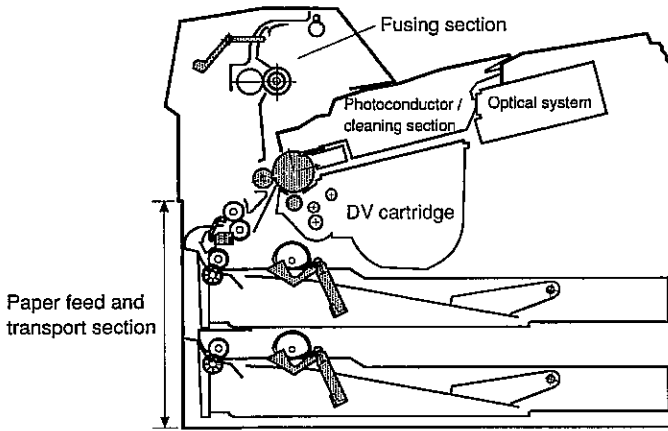


Fig. 7-1

1. Paper feed and transport section

1-1. Paper feed system

- 250-sheet cassette x 2 (Front loading)
- manual feed paper (Single feed)

1-2. Kinds of papers

Refer to [4] SUPPLIES.

1-3. Operational description

Timing of paper feed, transport, and paper discharge is shown below:

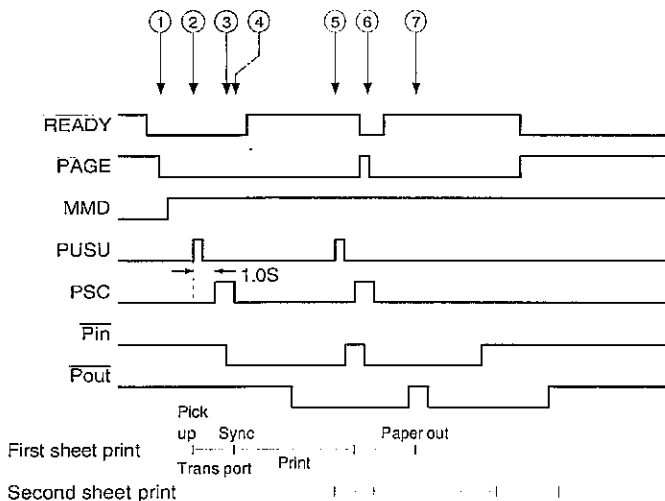


Fig. 7-2

1. When the machine receives a print request signal (PAGE) in the print ready mode, the main motor rotates to start the drive system.
2. When the main motor reaches a constant speed, the pick-up solenoid (PUSU, PUSL) turns on to pick up a paper in the cassette. The paper is transported to the PS roller by the transport roller.

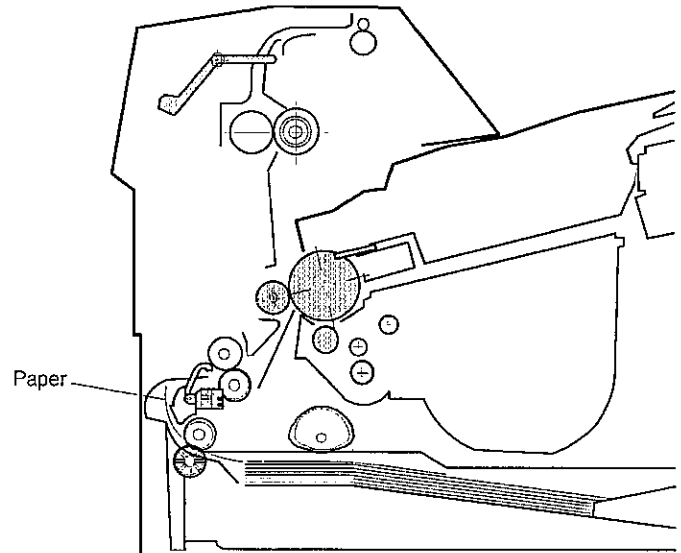


Fig. 7-3

3. After 1 sec of turning on of PUSU, PSC turns on (the PS roller stops) and the paper stops to make synchronization between the image lead edge and the paper lead edge.

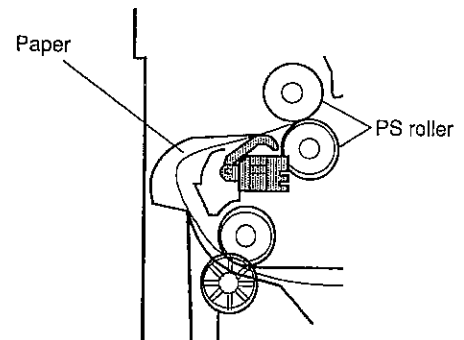


Fig. 7-4

4. PSC turns off (PS roller rotates) and the paper is transported through the transfer section to the fusing section.

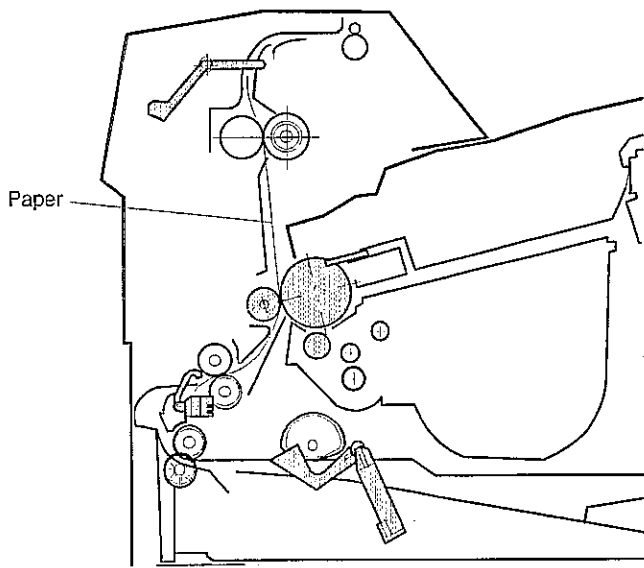


Fig. 7-5

5.6. PUSU turns on to pick up the second paper. If the first paper keeps turning on the PIN SW even after 1 sec of turning on of PUSU, PSC is not turned on. (If the first paper remains, PSC is turns on after 0.3 sec of turning off of the PIN SW.)

7. After transfer and fusing, the first paper is passed through POUT SW and discharged by the paper-out roller.

2. Print process section

Refer to [6] PRINT PROCESS.

3. Fusing section

After transfer, the toner image on the paper is fused on the paper by the heat and pressure of the heat roller.

Upper heat roller: A teflon roller is used.

Lower heat roller: A silicone rubber roller is used.

Roller cleaner: Used for cleaning the heat roller.

Separation pawl: Three pawls coated with teflon separate the paper from the heat roller.

Thermistor: Used to detect the temperature of the upper heat roller.

Thermostat: The contact opens when the fusing block temperature rises abnormally. (Hardware safety device)

Heater lamp: The heater lamp employs nickel-chrome wire (570W).

Temperature control

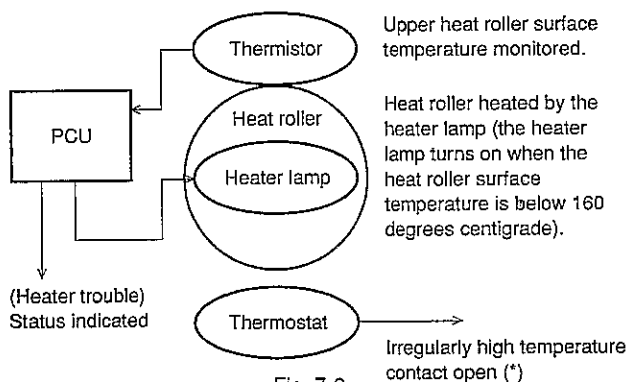


Fig. 7-6

Heater temperature control and heater trouble status

- Normal mode: 165°C
- Sleeve mode: 100°C
- Irregularly high temperature (C4) 240°C
- Irregularly low temperature (C5) 85°C
- Open thermistor (C6)

4. Optical system

All the parts in the optical system (the laser diode, etc.) are assembled in unit.

Note 1: Since the optical unit is replaced in unit, never disassemble it.

Note 2: Since the optical unit base is open, be careful to keep it away from dust and not to scratch the lens.

4-1. General

A laser beam issued from the semiconductor laser diode in synchronization with the video signal is focused collaterally by means of the collimator. It is exposed to the polygonal mirror that keeps rotating at a given speed, and the laser beam scans in the main scan direction as the mirror rotates. The main scan laser beam enters the focus correction lens where it is collected and focused to reflect the beam on the drum. The point where write starts is the point where the laser beam coming out of the focus correction lens is reflected by the trigger mirror exposes the photodiode.

4-2. Major components

Block diagram

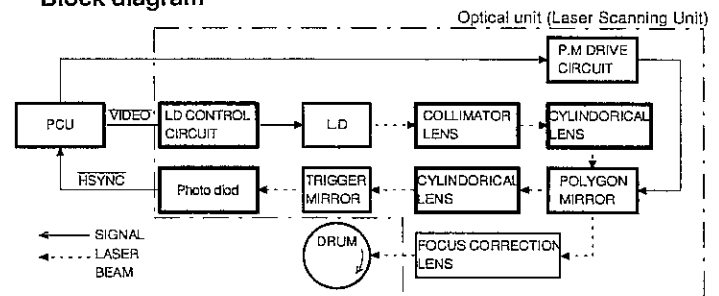


Fig. 7-7

| | |
|---------------------|--|
| Light source | Semiconductor laser diode (780nm wavelength) Laser output control PWB (APC circuit) |
| Deflector | Polygonal mirror, scan motor, control circuit board |
| Optics collimator | Focus correction lens, Collimator lens |
| Beam point detector | Pin diode Detect circuit board, Trigger mirror |

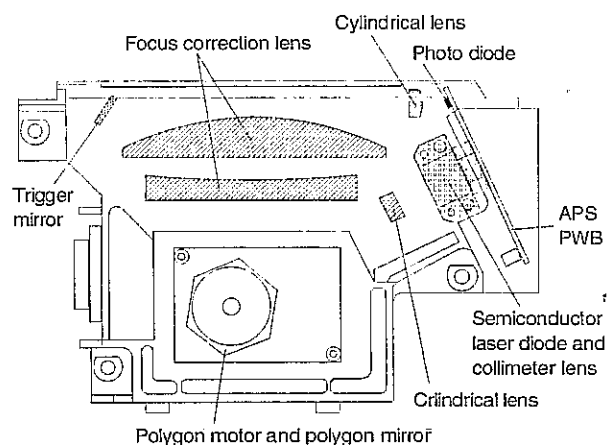


Fig. 7-8

[8] Disassembly, assembly and lubrication

8-1. Disassembly and assembly

CAUTION FOR SERVICING

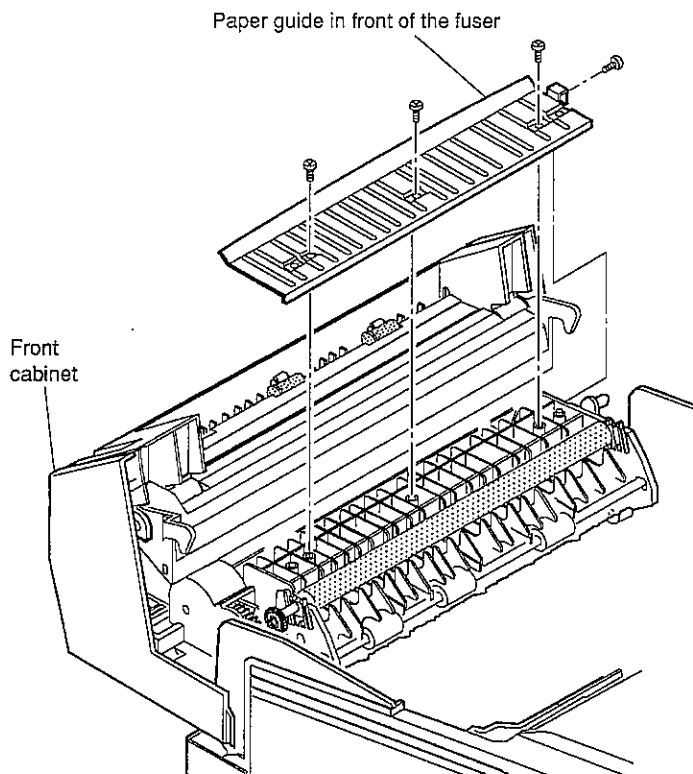
NEVER TOUCH THE AC/DC POWER PWB WITH THE AC CORD CONNECTED TO THE POWER OUTLET. IT MAY CAUSE A DANGEROUS ELECTRIC SHOCK.

This section describes the disassembly and assembly procedure. The descriptions include the following:

- A description is given for disassembly, re-assembly should be done in the reverse sequence.
Where specific caution is required, warnings are given.
- Disassembly and re-assembly items include the units and/or parts which may require replacement during maintenance level. The following description shows these units or parts.
- Describes the screws whose locations may be difficult to find, units or parts which must be removed in a specified order or require a special technique. The following description does not include the units or parts for which the re-assembly procedure is obvious.
- The cable clamp etc. are excluded from the description unless it requires special attention. Location of such items must be checked before its removal from the machine.
- Positions to be lubricated, see figures and descriptions.
- The optical system unit must be replaced as a whole unit without disassembly.
- All the disassembly procedures in this manual require disassembly of the front cabinet and the upper cabinet in advance.

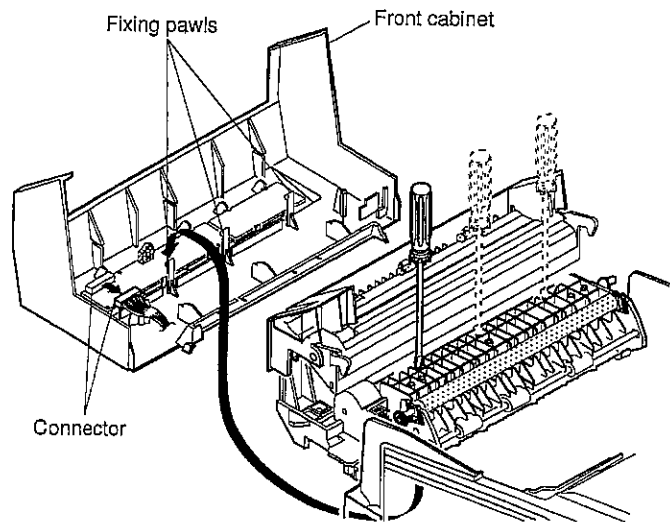
8-1-1. Front cabinet disassembly

- Remove the drum cartridge and the developer cartridge.
- Remove the paper guide in front of the fuser. (4 screws)
- Remove two screws which are fixing the front cabinet.



[Fig. 8-1]

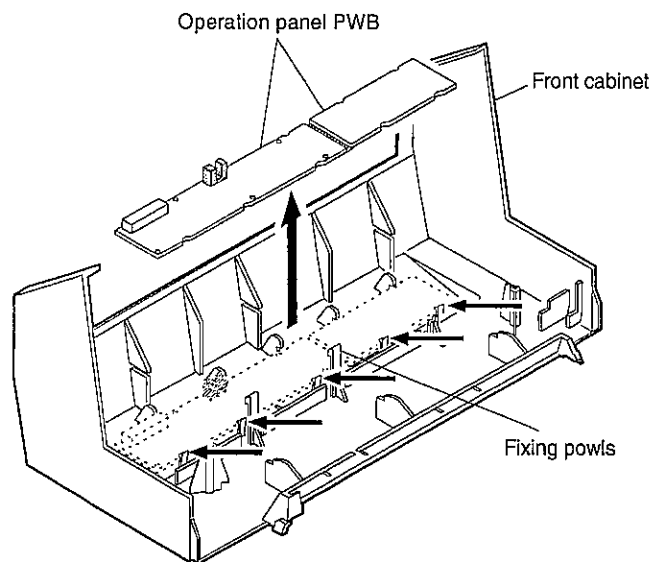
- Disengage three pawls which are fixing the front cabinet.
- Remove the front cabinet and disconnect the connector.



[Fig. 8-2]

8-1-2. Operation panel unit disassembly

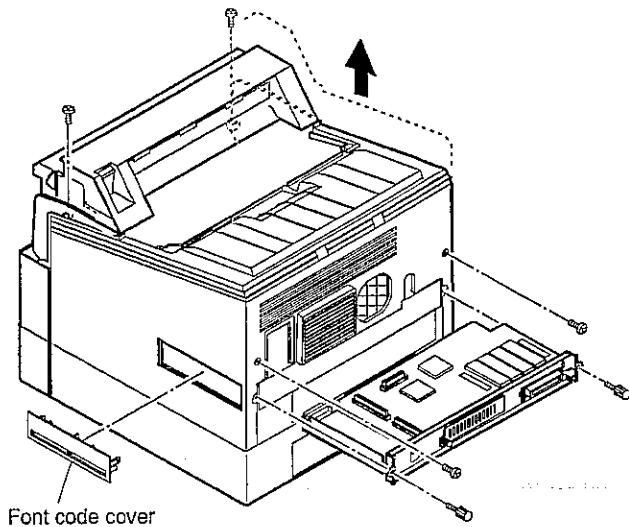
- Remove the front cabinet.
- Disengage five pawls which are fixing the panel PWB.



[Fig. 8-3]

8-1-3. Upper cabinet disassembly

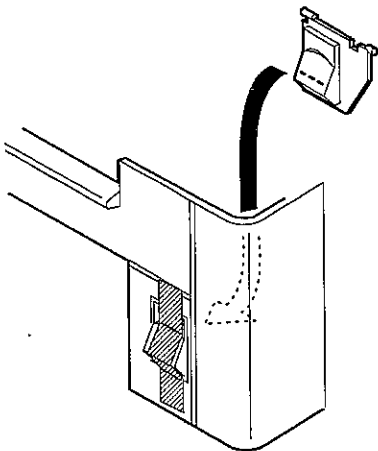
1. Remove the front cabinet. (Refer to 8-1-1)
2. Remove four screws which are fixing the upper cabinet.
3. Remove the Font card cover.
4. Remove the ICU unit
5. Pull out the upper cabinet upwards.



[Fig. 8-4]

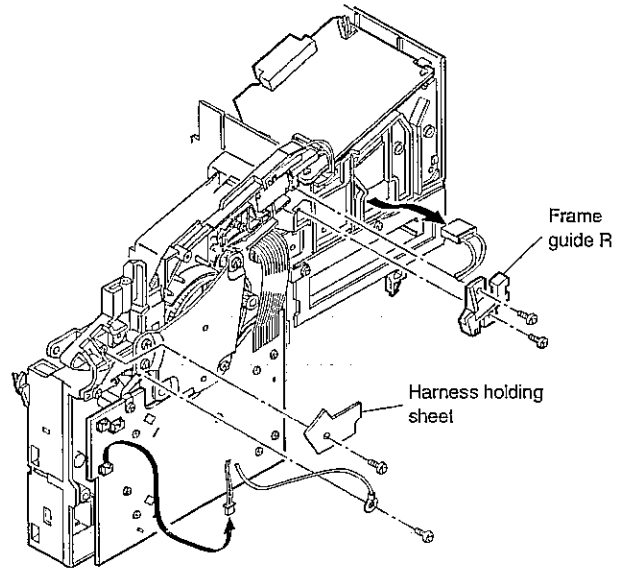
Note for assembly

1. When removing the upper cabinet, be careful not to damage the harness. (Arrange the harness so that it may not extrude from the upper frame.)
2. When attaching the upper cabinet, it is advisable to use adhesive tape to attach the cassette button.



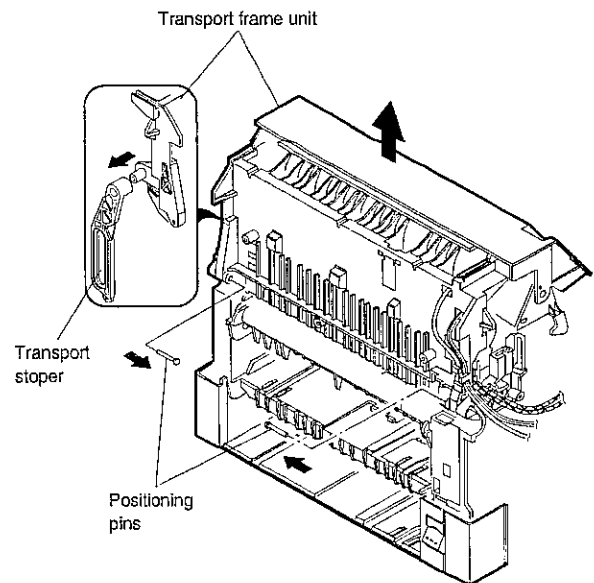
8-1-4. Transport frame unit disassembly

1. Remove the front cabinet and the upper cabinet. (Refer to 8-1-1 and 8-1-3)
2. Remove the frame guide R. (2 screws)
3. Remove the harness holding sheet. (1 screw)
4. Disconnect the connector of the thermistor.



[Fig. 8-5]

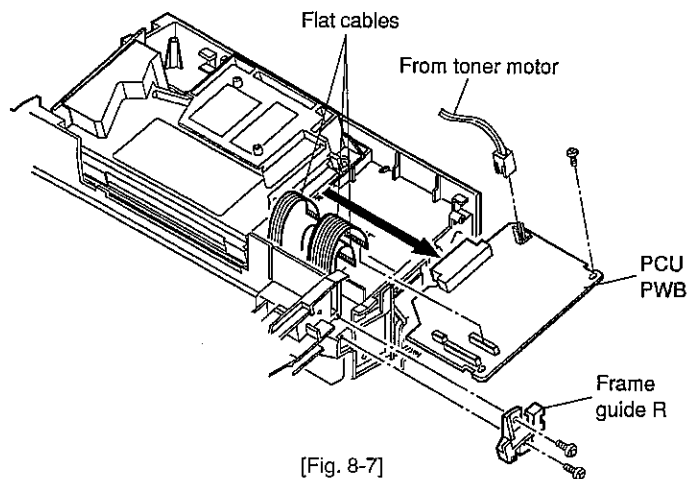
5. Remove two positioning pins.
6. Remove the transport unit from the transport stopper and pull it out upwards.



[Fig. 8-6]

8-1-5. PCU disassembly

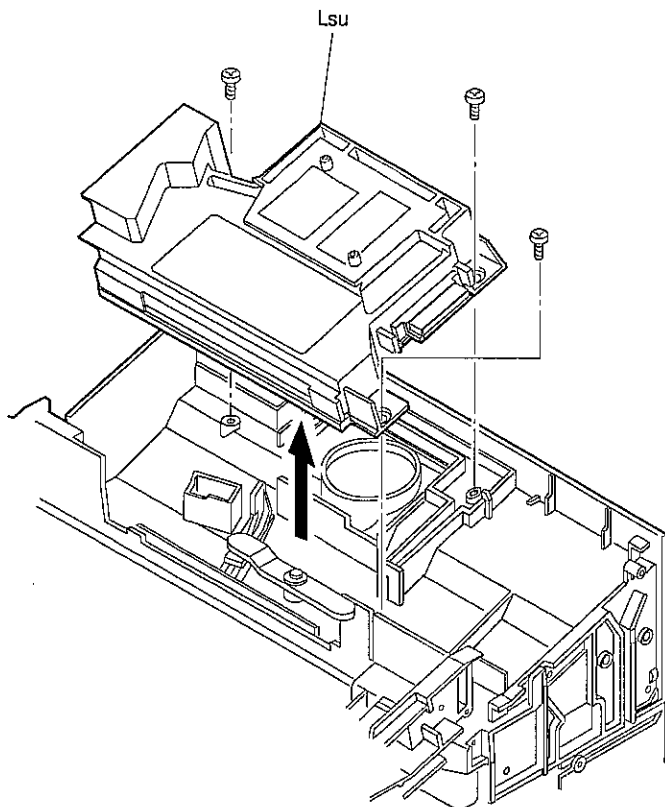
1. Remove the front cabinet and the upper cabinet. (Refer to 8-1-1 and 8-1-3)
2. Remove the frame guide R. (2 screws)
3. Remove the fixing screw of PCU.
4. Disconnect three flat cables and two connectors.
5. Slide PCU to the left (when viewed from the front) to remove it.



[Fig. 8-7]

8-1-6. LSU (optical unit) disassembly.

1. Remove the front cabinet and the upper cabinet. (Refer to 8-1-1 and 8-1-3)
2. Remove the PCU. (Refer to 8-1-5)
3. Remove three screws which are fixing the optical unit.



[Fig. 8-8]

Note 1: The bottom of the optical unit is open. Do not touch the bottom surface. Place it on a flat surface. Be careful not to allow dust to enter the unit.

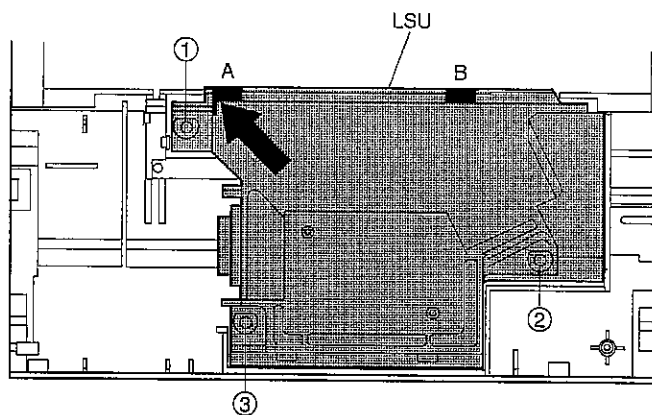
Note 2: Never disassemble the optical unit.

Note 3: Do not operate the machine with the optical unit disassembled.

Reassembly

For reassembly of the optical unit, follow the procedure below:

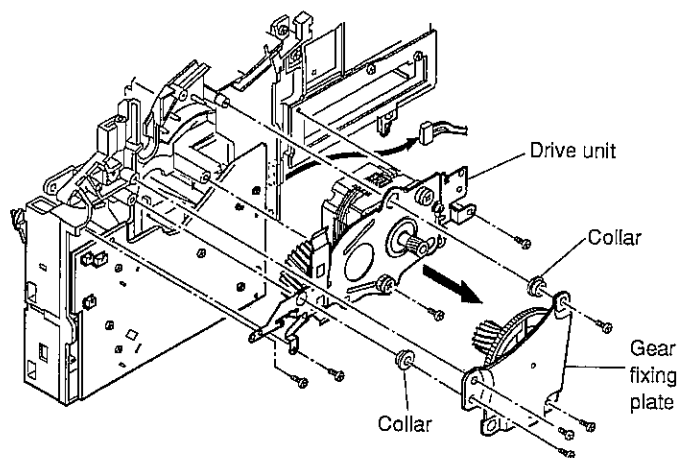
1. Fit the unit with corner A and press in direction B.
2. Fix the unit with screws. (Tighten screws in the sequence of ①, ②, and ③).



[Fig. 8-9]

8-1-7. Drive unit disassembly

1. Remove the front cabinet and the upper cabinet. (Refer to 8-1-1 and 8-1-3)
2. Remove four screws which are fixing the gear fixing plate.
3. Remove the gear fixing plate ass'y.
4. Remove four screws which are fixing the drive unit.
5. Slide the drive unit to the right (when viewed from the front) to remove.

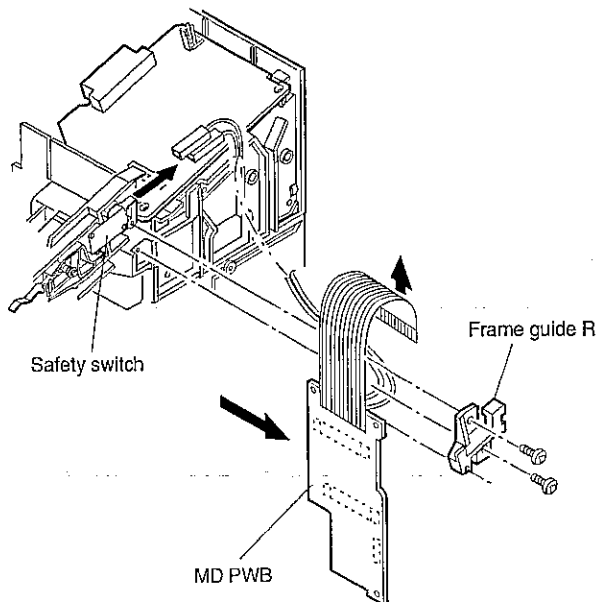


[Fig. 8-10]

* The collars are provided to protect the harness. Be careful to observe the correct direction when installing the collars.

8-1-8. MD (Motor Drive) PWB disassembly

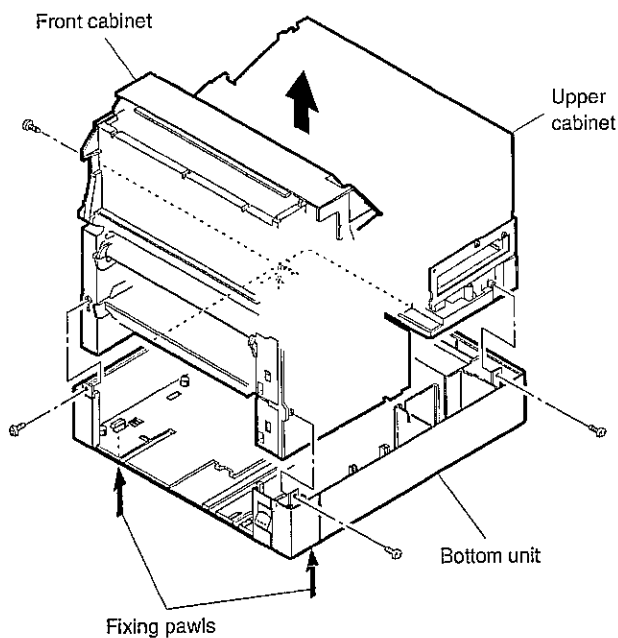
1. Remove the drive unit. (Refer to 8-1-7)
2. Remove the screw which is fixing the PWB chassis, and slide the PWB chassis. (Refer to 8-1-24.)
3. Remove two terminals of the safety switch.
4. Pull out the flat cable.
5. Slide the MD PWB to the right (when viewed from the front) to remove.



[Fig. 8-11]

8-1-9. Bottom unit (lower cassette section) disassembly

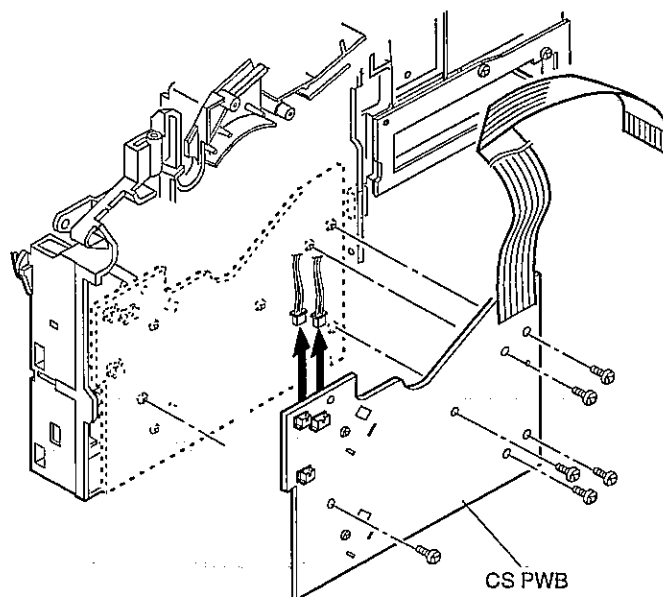
1. Remove the upper cabinet and the front cabinet. (Refer to 8-1-1 and 8-1-3)
2. Remove four screws which are fixing the bottom unit.
3. Disengage two pawls of the bottom and remove the bottom unit.
- * Be careful not to break the pawl.



[Fig. 8-12]

8-1-10. Cassette PWB (CS PWB) disassembly

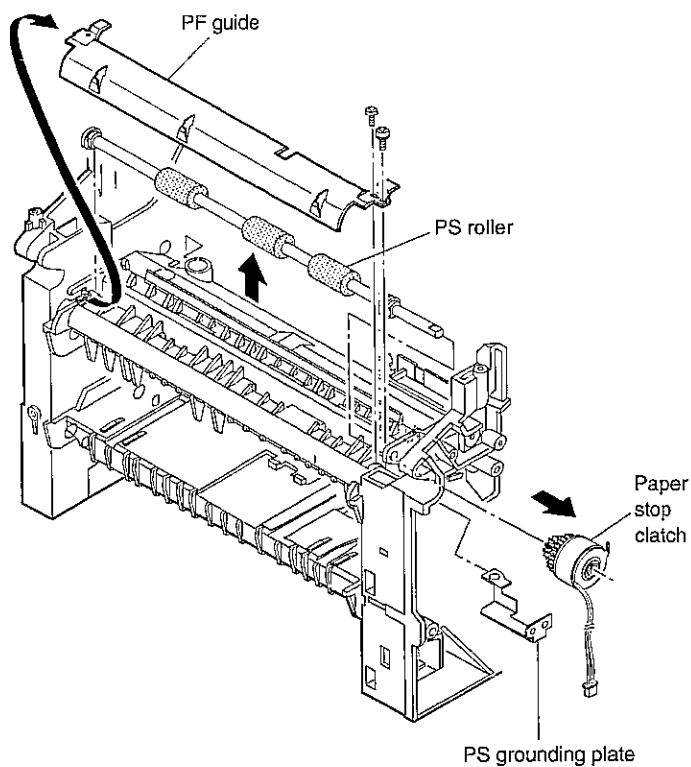
1. Remove the front cabinet, the upper cabinet, and the bottom unit. (Refer to 8-1-1, 8-1-3 and 8-1-9)
2. Disconnect three connectors.
3. Remove seven screws which are fixing the PWB and remove it.



[Fig. 8-13]

8-1-11. PS roller disassembly

1. Remove the drive unit. (Refer to 8-1-7)
2. Remove the electromagnetic clutch (PS clutch).
3. Remove two screws which are fixing the PF guide.
4. Remove the PF guide and the PS grounding plate simultaneously.
5. Pull up the PS roller to remove.



[Fig. 8-14]

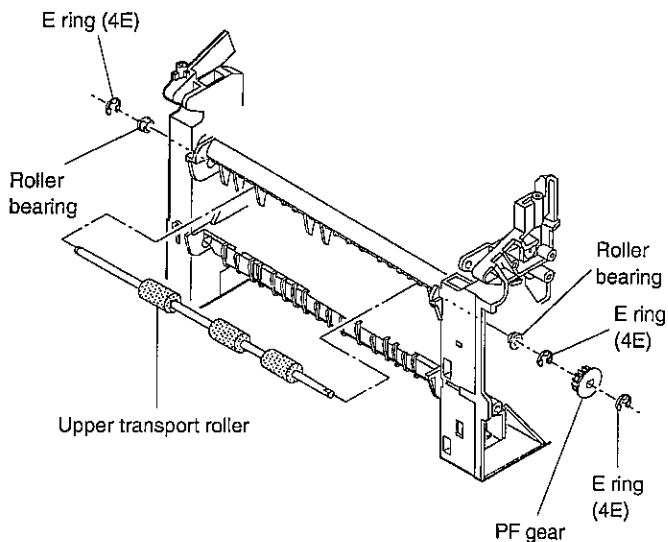
8-1-12. Upper transport roller and PIN sensor disassembly

1. Remove the drive unit. (Refer to 8-1-7)
2. Remove the right and the left E rings, and remove the PF gear.
3. Remove the right and the left roller bearings.

Note: Note that the bearings are identified by their colors. The right bearing : Black
The left bearing: White

4. Remove the roller.

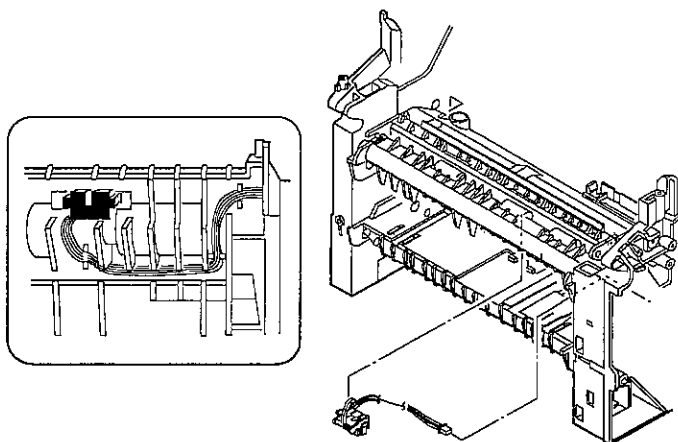
(Reference) The lower transport roller can be removed in the same manner.



[Fig. 8-15A]

Note: Since the right bearing is grounded, check to confirm that the grounding spring and the bearing are in contact when assembled.

5. Remove the PIN sensor pawl and remove the PIN sensor.
When attaching the PIN sensor, process the lead wire properly.



[Fig. 8-15B]

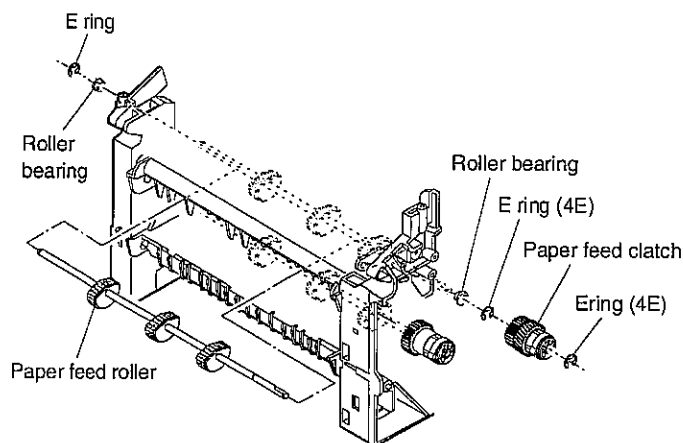
8-1-13. Paper feed roller (pickup) upper disassembly

1. Remove the drive unit. (Refer to 8-1-7)
2. Remove E-ring (4E) and remove the paper feed clutch (spring clutch).
3. Remove the right and the left E-rings and remove the bearing.

Note 1: The bearings are identified with their colors.
The right bearing: Black
The left bearing: White

4. Remove the paper feed roller.

(Reference) The lower paper feed roller can be removed in the same manner.

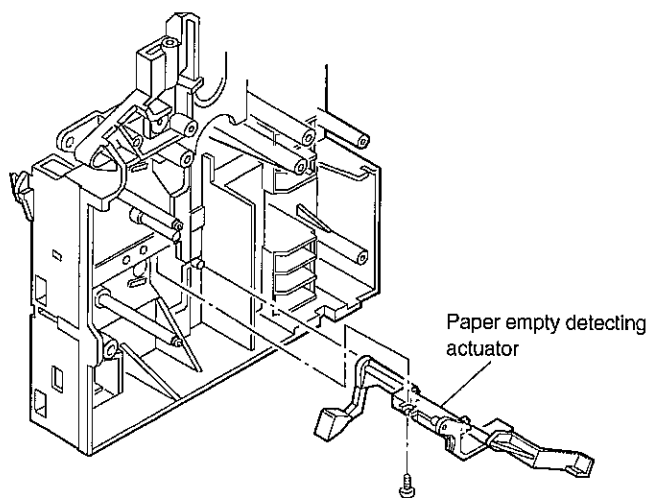


[Fig. 8-16]

Note 2: Since the right bearing is grounded, check to confirm that the grounding spring and the bearing are in contact when assembled.

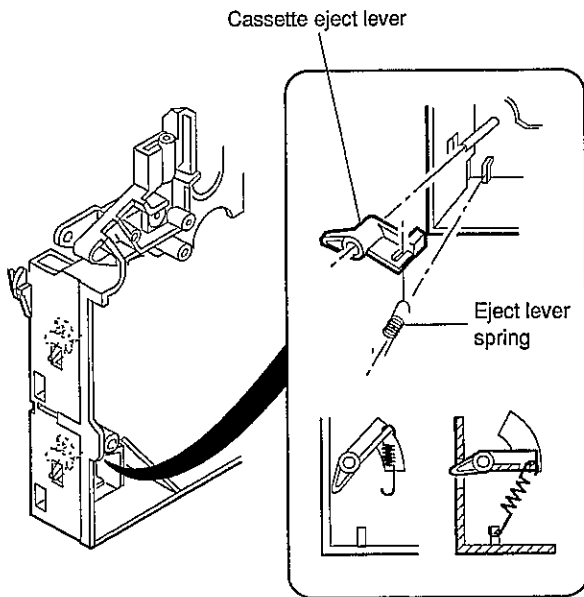
8-1-14. Guide frame unit

1. Remove the drive unit, the lower transport roller and the lower paper feed roller. (Refer to 8-1-7, 8-1-12 and 8-1-13)
2. Remove the screw which is fixing the lower cassette paper empty detecting actuator (PEL).
3. Slide the paper empty detecting actuator to the right (when viewed from the front) to remove.



[Fig. 8-17]

4. Remove the spring of the cassette eject lever, and remove the lever.

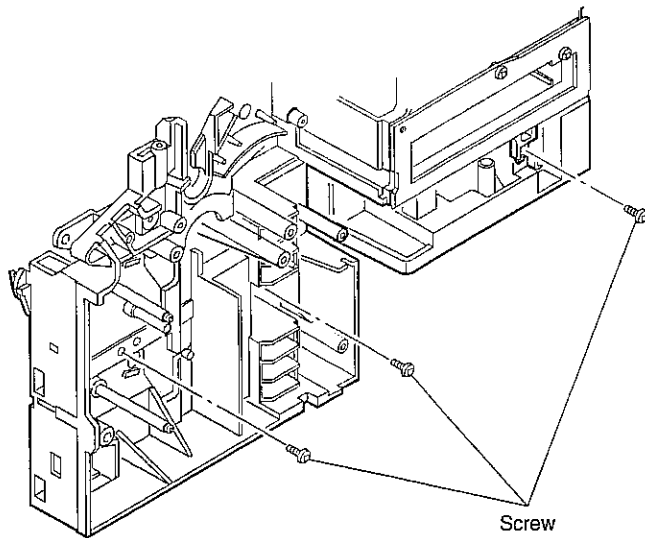


[Fig. 8-18]

Note: Be careful to observe the correct hook direction when assembling the spring.
(The longer hook should be attached to the frame side.)

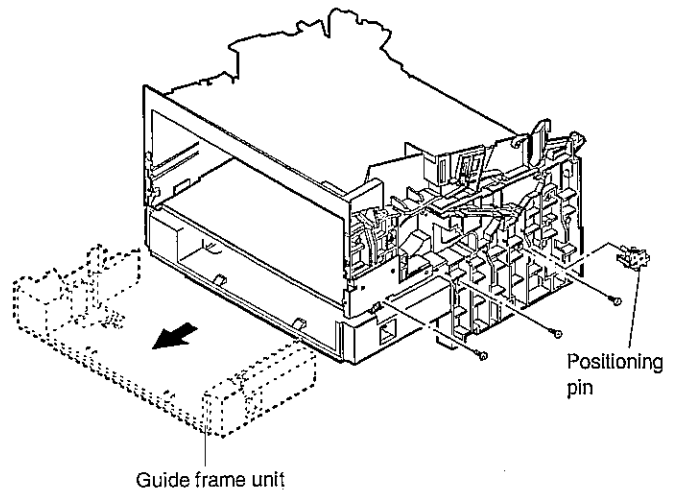
5. Remove the screws which are fixing the guide frame unit. (3 screws in the right, 3 screws in the left)
6. Remove the positioning pin.
7. Slide the guide frame unit backward to remove.

[Right side]



[Fig. 8-19]

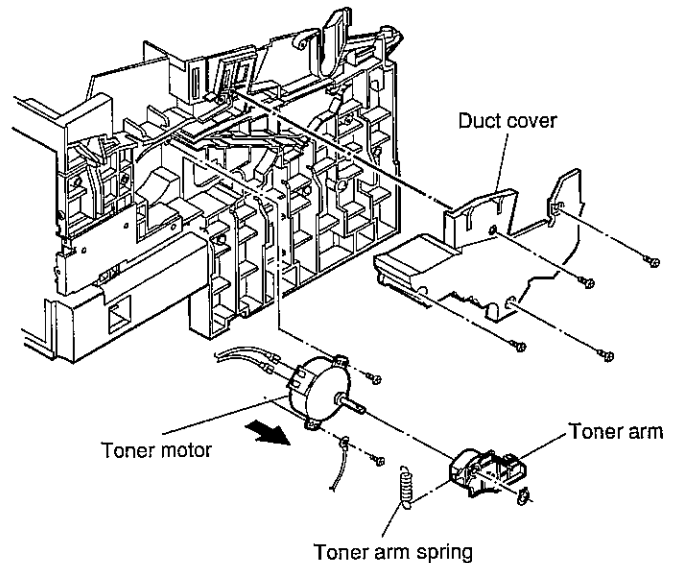
[Left side]



[Fig. 8-20]

8-1-15. Toner motor disassembly

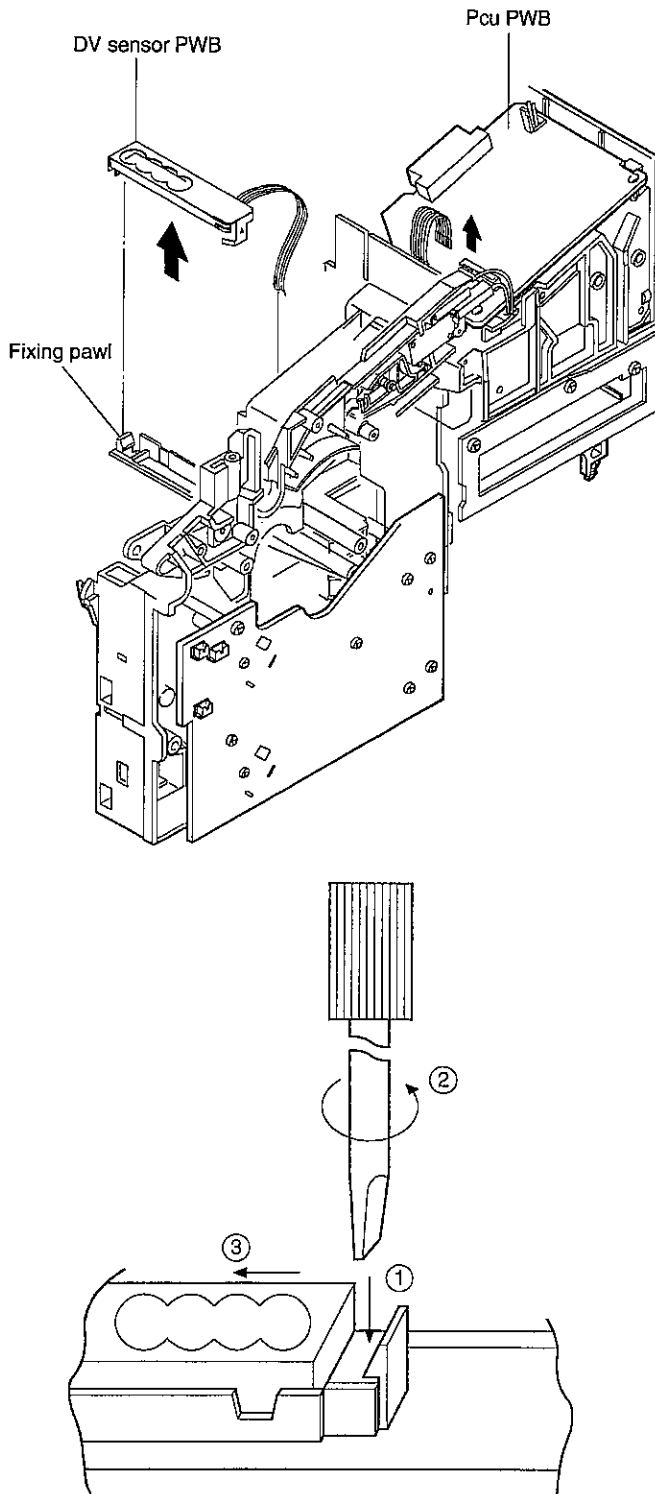
1. Remove the drive unit. (Refer to 8-1-7)
2. Remove the duct cover
3. Remove the toner arm spring.
4. Remove two screws which are fixing the toner motor, and remove the toner motor.



[Fig. 8-21]

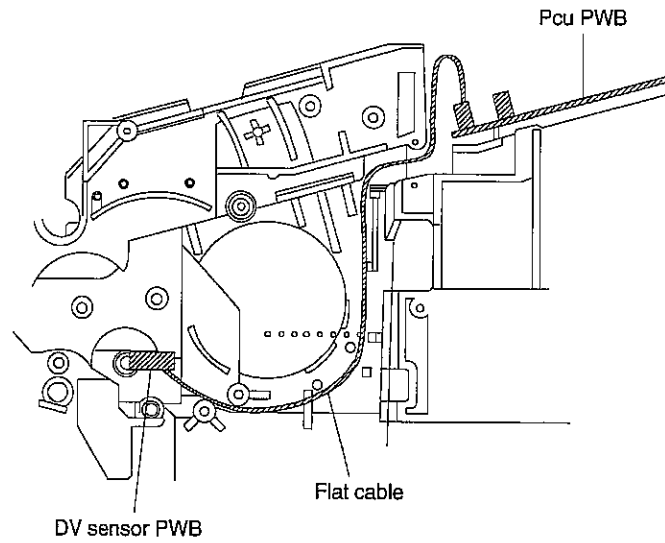
8-1-16. DV sensor PWB disassembly

1. Remove the drive unit. (Refer to 8-1-7)
 2. Disconnect the cable from the PCU PWB connector (CN103).
 3. Disengage the pawl which is fixing the sensor PWB and remove the PWB.
- ※ When removing the DV sensor PWB be careful not break the fixing pawl.



[Fig. 8-22]

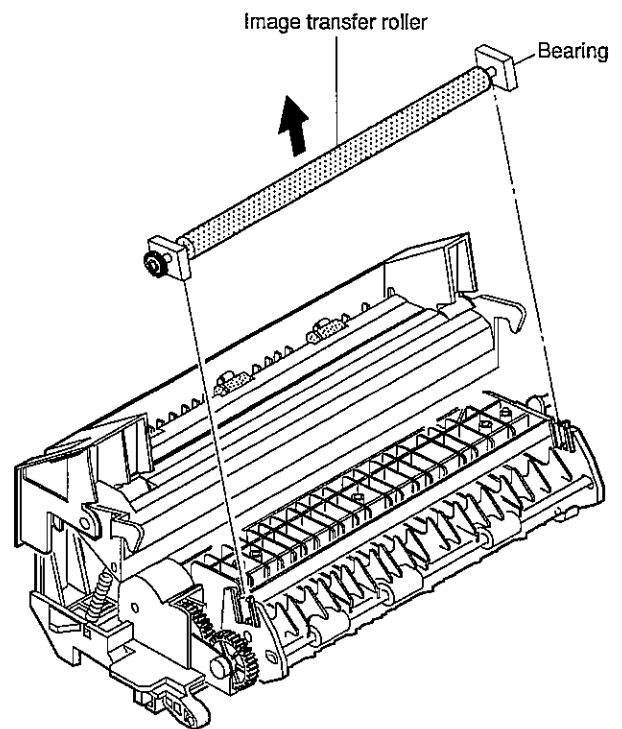
Note: When assembling the sensor PWB, be careful of the wiring.



[Fig. 8-23]

8-1-17. Image transfer roller disassembly

1. Remove the drum cartridge and the DV cartridge.
2. Disengage the bearing pawl and remove the bearing roller.



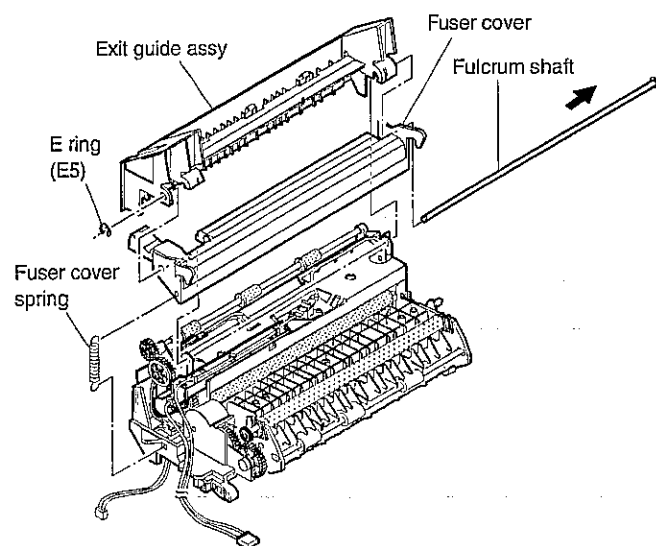
[Fig. 8-24]

Note for transfer roller handling

1. When touching the roller, use gloves and do not touch with naked hands. (Use UKOGZ0002FCZZ.)
2. Do not apply pressure to the rubber section. It may deform the roller.
3. Place the roller on a flat, clean surface.
4. Do not scratch the rubber surface. It may cause transfer errors.
5. Keep the rubber surface free of foreign materials. If necessary, clean the surface with clean cloth. (Do not use alcohol.)

8-1-18. Heater lamp replacement

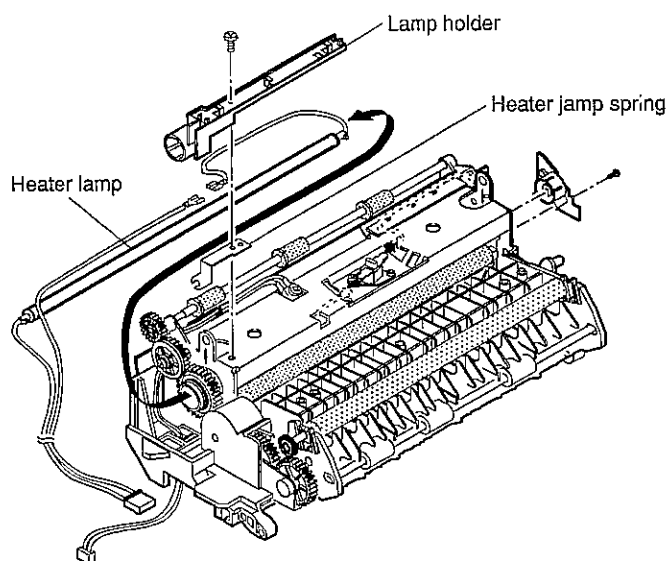
1. Remove the front cabinet and the upper cabinet. (Refer to 8-1-1 and 8-1-3)
2. Remove the E-ring (E5) which is fixing the paper exit guide ass'y by sliding the fulcrum shaft.
3. Remove the paper exit guide ass'y.
4. Remove the fuser cover spring and remove the fuser cover.



[Fig. 8-25]

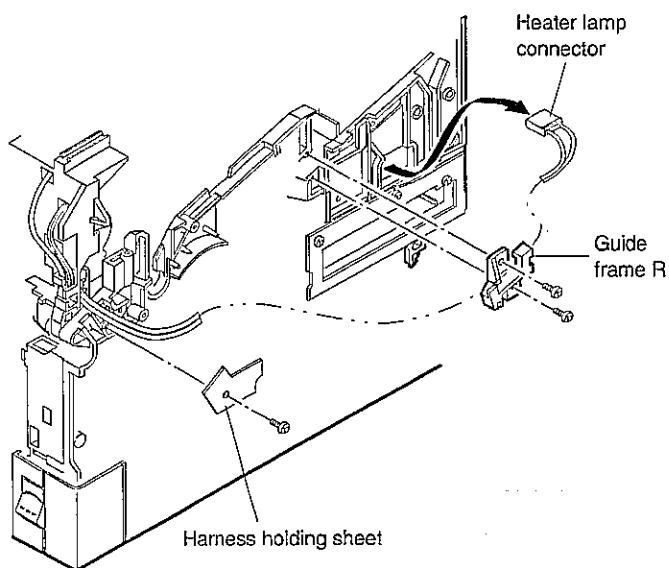
5. Remove the heater lamp holder, and heater lamp spring.
6. Slide the heater lamp to the right when viewed from the front to remove.

※ When removing the heater lamp, do not pull the lead wire. (The nickel-chrome wire may be extended.) Hold the insulator and the glass to pull.



[Fig. 8-26]

6. Remove the harness holding sheet (one screw) and the guide frame R (two screws).
7. Disconnect the connector from the power unit.

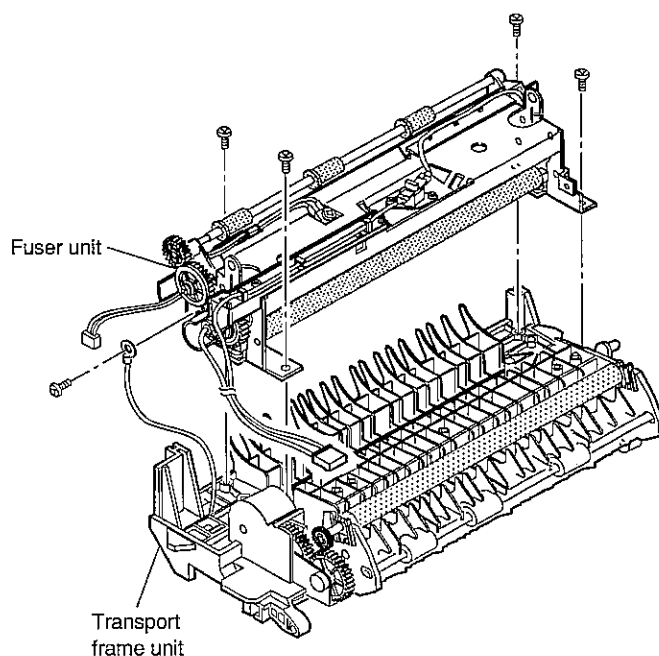


[Fig. 8-27]

Note: When assembling the lamp, be careful to the harness wiring.

8-1-19. Fuser unit disassembly

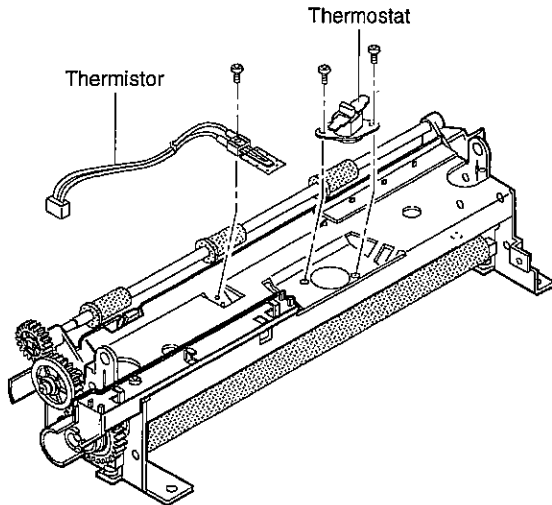
1. Remove the front cabinet, the upper cabinet, and the transport frame unit. (Refer to 8-1-1, 8-1-3 and 8-1-4)
2. Remove the four screws which are fixing the fuser unit.
3. Remove the screw for GND harness.
4. Remove the harness holding sheet and the guide frame R.



[Fig. 8-28]

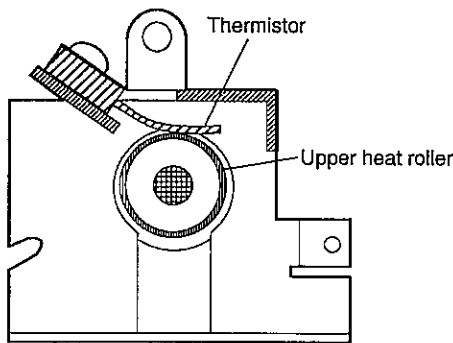
8-1-20. Thermistor replacement

1. Remove the fuser unit. (Refer to 8-1-19)
2. Remove the screw which is fixing the thermistor and remove the thermistor.



[Fig. 8-29]

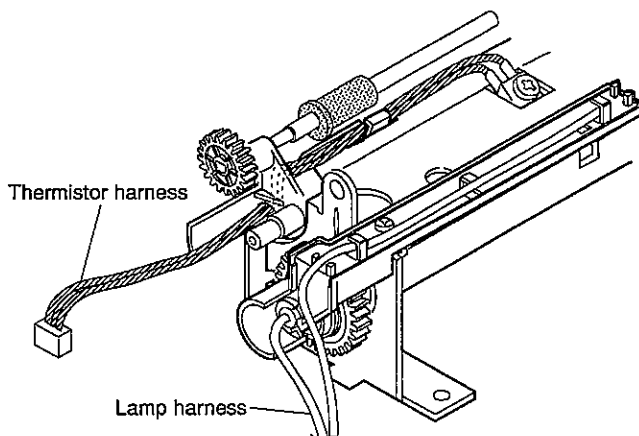
Note 1: For assembly of the thermistor, refer to the figure below and check that the thermistor is in contact with the heat roller.



[Fig. 8-30]

Note 2: Place the thermistor so that the positioning projection is on the lower side.

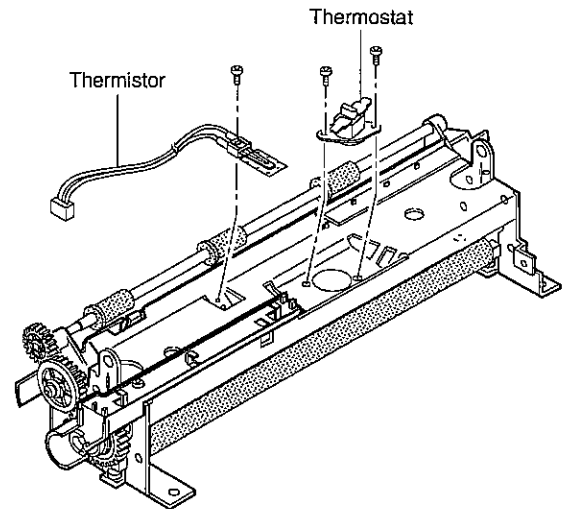
Note 3: For wiring of the thermistor harness, remove slack in the harness and fix with the binding band. Be careful not to allow the harness to be in contact with the paper exit roller and the gears.



[Fig. 8-31]

8-1-21. Thermostat replacement

1. Remove the fuser unit. (Refer to 8-1-19)
2. Remove two screws which are fixing the thermostat, and remove the thermostat.

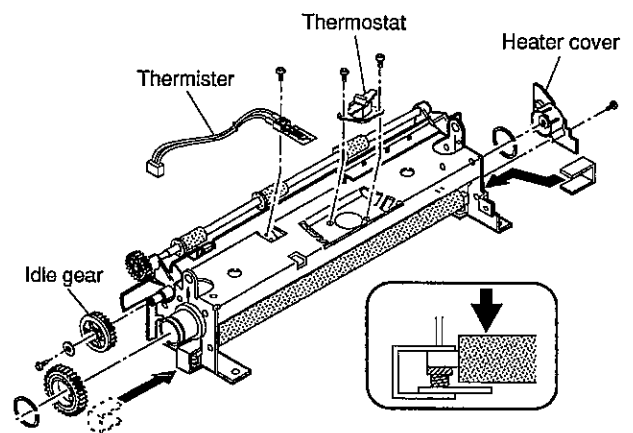


[Fig. 8-32]

Note: When assembling, check that the clearance between the thermostat and the heat roller is $0.75 \pm 0.25\text{mm}$.

8-1-22. Heat roller disassembly

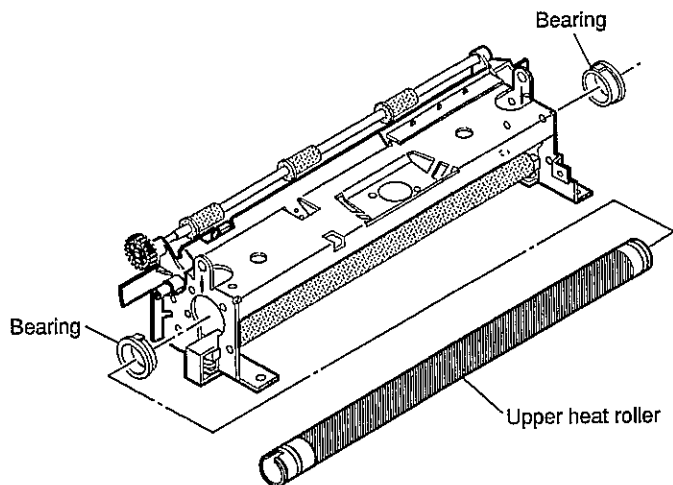
1. Remove the fuser unit. (Refer to 8-1-19)
2. Remove the heater lamp. (Refer to 8-1-18)
3. Remove the idler gear and heat roller gear.
4. Remove the heater cover.
5. Use the heat roller replacement jig to release the pressure. Remove the thermistor and the thermostat.
6. Remove two C-rings (one in the right and one the left).



[Fig. 8-33]

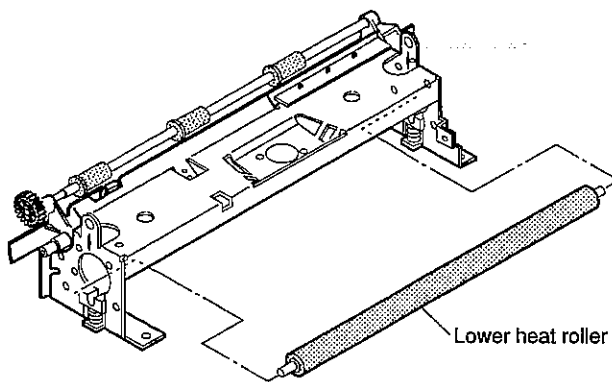
7. Remove the bearings (one in the right and one in the left).

8. Remove the upper heat roller.



[Fig. 8-34]

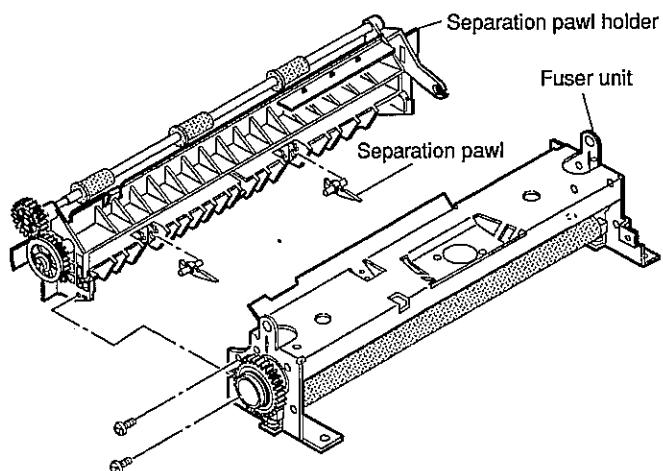
9. Remove the lower heat roller.



[Fig. 8-35]

8-1-23. Fusing separation pawl disassembly

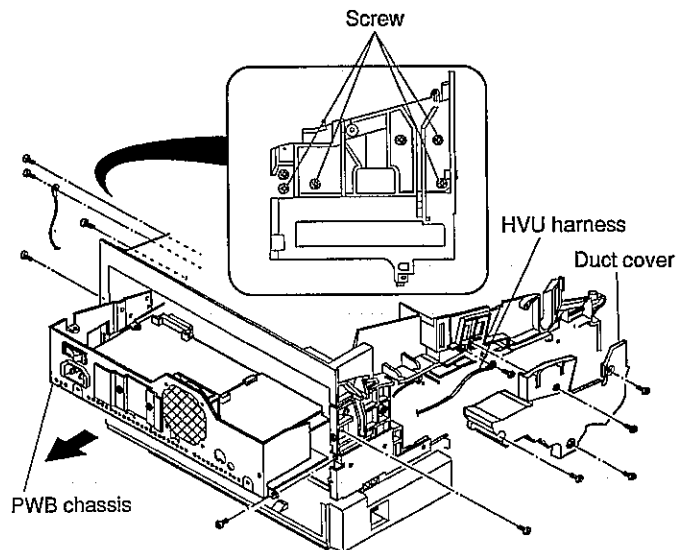
1. Remove the fuser unit. (Refer to 8-1-19)
2. Remove two screws which are fixing the separation pawl holder.
3. Slide the separation pawl first to the left when viewed from the front, and disengage the right side.
4. Remove the separation pawl.



[Fig. 8-36]

8-1-24. Power PWB and high voltage PWB disassembly

1. Remove the front cabinet and the upper cabinet. (Refer to 8-1-1 and 8-1-3)
2. Remove the duct cover.
3. Remove the high voltage unit cable (red one).
4. Remove the screws (4 in the right, 2 in the left) which are fixing the bottom plate, and pull out the power chassis.

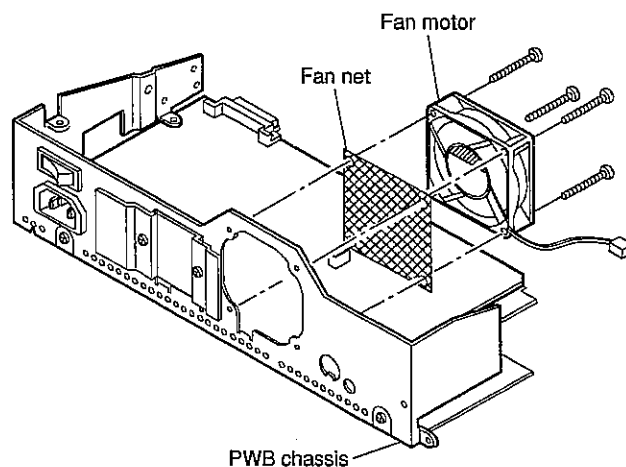


[Fig. 8-37]

8-1-25. Fan disassembly

1. Remove the power unit. (Refer to 8-1-24)
2. Remove the screw which is fixing the fan, and remove the fan.

Peassembly: To reassemble the fan, follow the instruction shown in the figure below. (Take care to the direction of blowing.)



[Fig. 8-38]

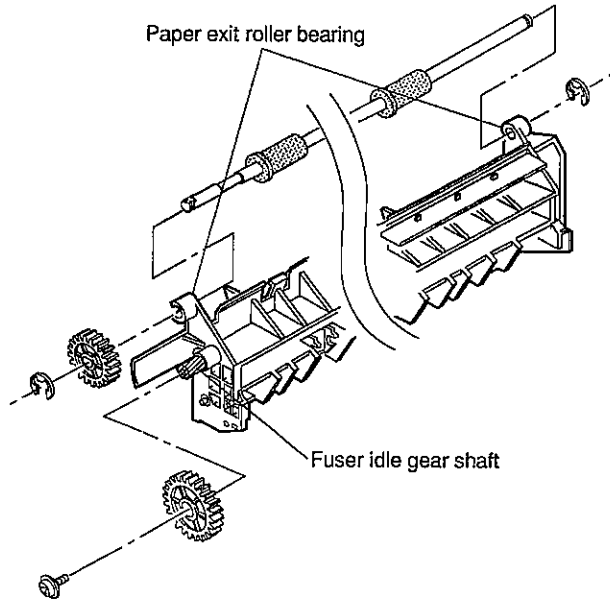
8-2. Lubrication

When disassembling/reassembling or replacing parts, the following sections should be greased.

Note 1: Apply proper quantity of grease (UKOG-0062FCZZ) to the gear surface.

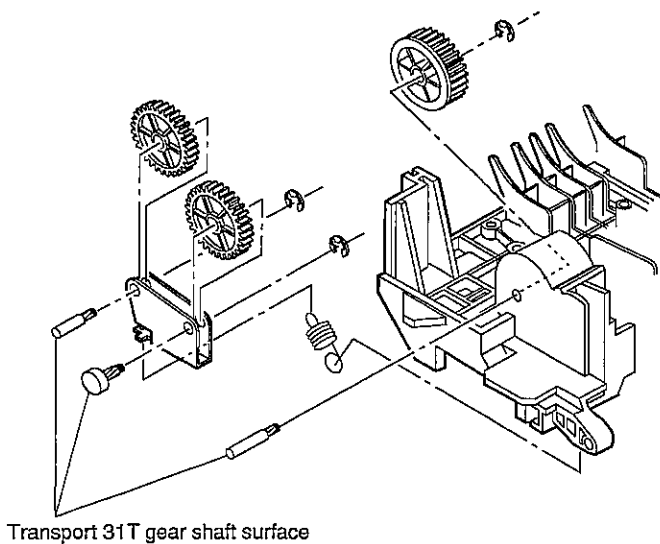
Note 2: Unless other wise specified, apply white molykote (UKOG-0158FCZZ) to the sections.

8-2-1. Fuser section



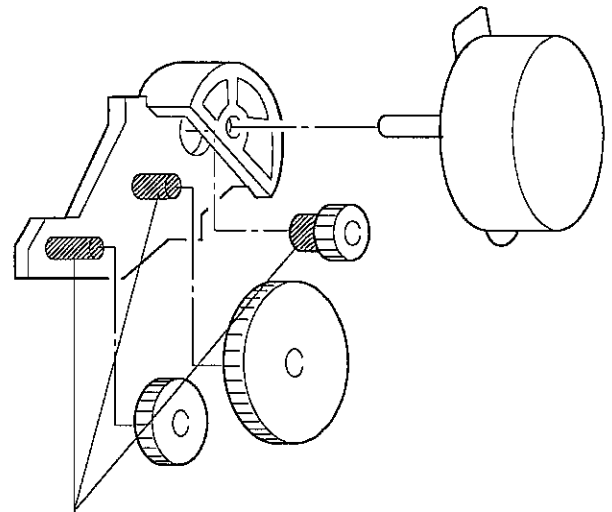
[Fig. 8-39]

8-2-2. Transport section



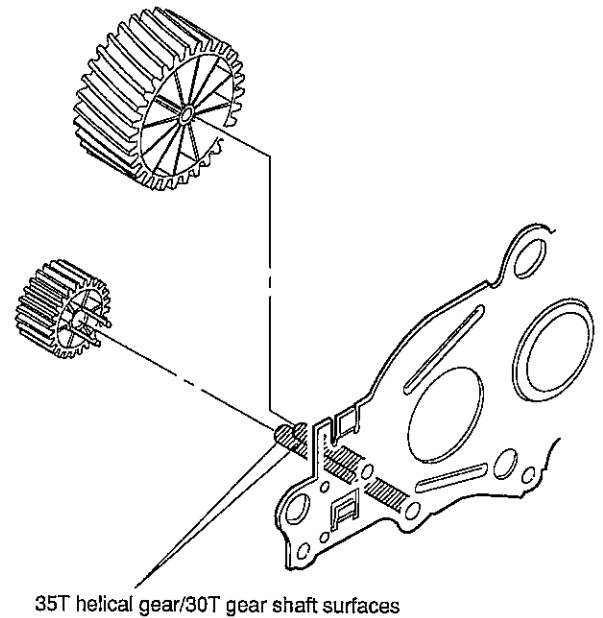
[Fig. 8-40]

8-2-3. Toner motor section

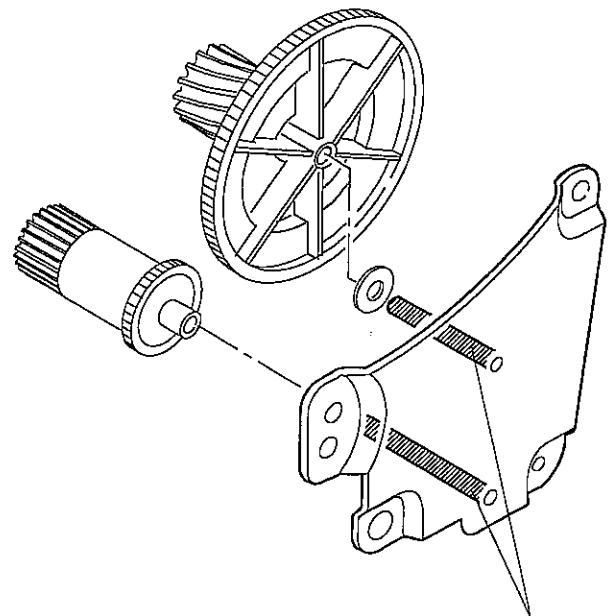


[Fig. 8-41]

8-2-4. Drive unit section



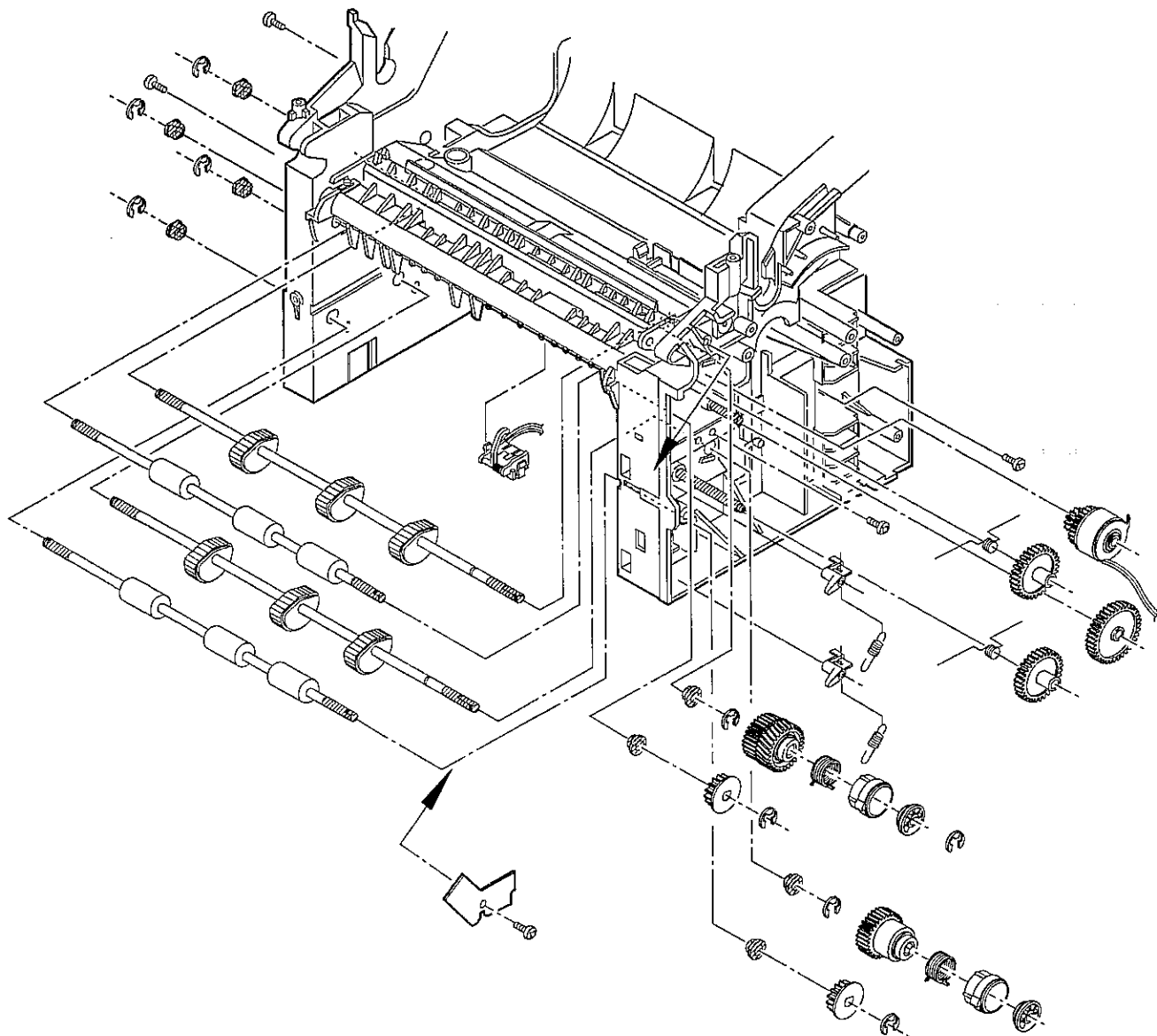
[Fig. 8-42]



[Fig. 8-43]

8-2-5. Paper feed section

1. Apply grease to the surfaces of the upper and the lower pickup rollershafts and the upper and the lower transport roller shafts.
2. Apply grease to the inside of each roller bearing.
3. Apply grease to the surface of each gear shaft.



[Fig. 8-44]

[9] ADJUSTMENTS

9-1. Top margin and left margin adjustments

Top margin and left margin should be adjusted in the following cases:

1. When the margin differs from the reference value.
2. When EE-PROM is replaced.
3. When ICU is replaced.
4. When the optical unit (LSU) is replaced.

1. Reference value

(Top margin)

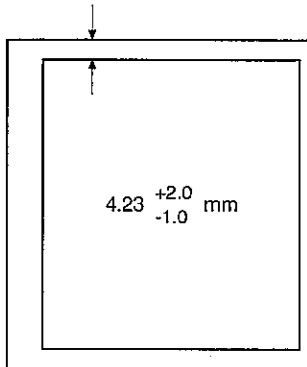


Fig. 9-1

(Left margin)

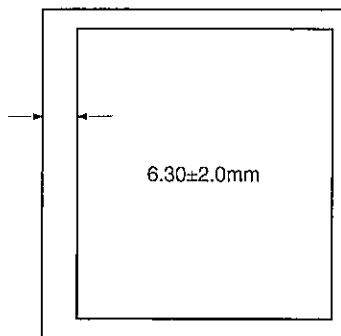


Fig. 9-2

- ⑥ Repeat procedure ③ to adjust the value.
- ⑦ Press the **ENTER** key. (When the **MENU** key is pressed, the process returns to ②.)
- ⑧ The data lamp lights up and the machine goes into the off-line state. Test print #2 is automatically performed. (One sheet of print is obtained.)
- ⑨ For readjustment, perform procedures from ①.

2. Adjustment procedures

- ① With the **LINE** key and the **FONT** key pressed, turn on the power.
- ② The display will indicate **TOP MARGIN = XX**. "XX" is the currently set value.
- ③ Change the set value with **▲** and **▼** keys. (Within the range of 38 to 99)
 - When the top margin is greater than the reference value:
Use **▼** key to reduce the top margin. (Min. 38)
 - When the top margin is smaller than the reference value:
Use **▲** key to increase the top margin. (Max. 99)

Note: Change in 1 count corresponds to $4/300 = 0.34\text{mm}$.
- ④ Press the **MENU** key.
- ⑤ The display will indicate **LEFT MARGIN = XX**. "XX" is the currently set value.

[10] TEST PRINT AND DIAGNOSTICS

The base engine conditions can be checked with the following test print and PCU diagnostics.

- **Test print**

When the TEST key on the operation panel is depressed until SELF TEST #2 is displayed, the controller prints part of the built-in font diagonally.

- **PCU diagnostics**

The PCU diagnostics are provided for the service engineers to check the conditions of each section of the base engine.

PCU DIAGNOSTICS SPECIFICATIONS

1. Entering the DIAGNOSTIC mode

Keep the MENU and ENTER keys depressed, turn on the power switch.

2. Executing DIAGNOSTIC function

Select the menu with the MENU and Δ , ∇ keys, and execute diagnostic function with FORM FEED keys.

To return to the menu during execution of diag function, press the RESET key.

3. DIAGNOSTIC display

When the machine enters into DIAG mode:

1. All LED's are lighted for 0.5 sec.
2. "PCU DIAG MODE X" is displayed. (X: PCU ROM version)

When diagnostic is being executed:

DATA LED is blinks.

Reference

When the front cabinet is removed, the actuator of the paper out sensor is disassembled to disable the operation. In this case, insertion of a paper into the slit in the photo sensor allows the operation. Paper pass operation, however, cannot be performed.

4. List of the functions

| Menu | Function | Execution | Cancel | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|------------------|--|----------------|-------------|--------------|------|---------|-----|-----------|------|------|---|-----|-----|------|------|--------------|-----|-----|------|------|--------------|-------------|----------------------------------|-----|----|--------------------------|--------|----|--------------------------|-------|----|---|----------------|-------------|---------|
| PCU DIAG MODE # | "#" shows a ROM version. This menu shows only a ROM version and does not perform any operation. | — | [FORM FEED] | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| SW SCAN XX | Shows the internal switch state with LED. XX is a figure from 01 to 06. (Varied with Δ and ∇ keys.) The contents are as shown below. Performed with the FORM FEED key. During operation, XX of the LCD blinks. During operation, Δ and ∇ keys are disabled. LED light up or goes off according to each switch. <table><tr><th>XX</th><th>LED ERROR</th><th>MANUAL</th><th>DATA</th><th>ON LINE</th></tr><tr><td>01</td><td>DOOR OPEN</td><td>PIN</td><td>POUT</td><td>—</td></tr><tr><td>02</td><td>UPE</td><td>CS1U</td><td>CS2U</td><td>UPPER CASSET</td></tr><tr><td>03</td><td>LPE</td><td>CU1L</td><td>CS2L</td><td>LOWER CASSET</td></tr></table> LED lights up by pressing the switches in sequence. <table><tr><th></th><th>SEQUENCE</th><th>LED</th></tr><tr><td>04</td><td>PEU → CS1U → CS2U → CS3U</td><td>MANUAL</td></tr><tr><td>05</td><td>PEL → CS1L → CS2L → CS3L</td><td>ERROR</td></tr><tr><td>06</td><td>PEU → CS1U → CS2U → CS3U → PEL → CS1L → CS2L → CS3L</td><td>ERROR & MANUAL</td></tr></table> 06: When the upper cassette is completed, the MANUAL lamp lights up. When the operation is completed, the ERROR lamp lights up. | XX | LED ERROR | MANUAL | DATA | ON LINE | 01 | DOOR OPEN | PIN | POUT | — | 02 | UPE | CS1U | CS2U | UPPER CASSET | 03 | LPE | CU1L | CS2L | LOWER CASSET | | SEQUENCE | LED | 04 | PEU → CS1U → CS2U → CS3U | MANUAL | 05 | PEL → CS1L → CS2L → CS3L | ERROR | 06 | PEU → CS1U → CS2U → CS3U → PEL → CS1L → CS2L → CS3L | ERROR & MANUAL | [FORM FEED] | [RESET] |
| XX | LED ERROR | MANUAL | DATA | ON LINE | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 01 | DOOR OPEN | PIN | POUT | — | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 02 | UPE | CS1U | CS2U | UPPER CASSET | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 03 | LPE | CU1L | CS2L | LOWER CASSET | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | SEQUENCE | LED | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 04 | PEU → CS1U → CS2U → CS3U | MANUAL | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 05 | PEL → CS1L → CS2L → CS3L | ERROR | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 06 | PEU → CS1U → CS2U → CS3U → PEL → CS1L → CS2L → CS3L | ERROR & MANUAL | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| OPTICAL SYS TEST | Laser test is performed. Pressing the FORM FEED key performs the operation. During operation, DATA LED blinks. LED of on-line lights for 60ms every time when SYNC- is detected. | [FORM FEED] | [RESET] | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| VOL TEST XXX | Performs the test of high voltage section. XXX is MCH, MCL, or TC+. They are displayed in sequence with Δ and ∇ keys. The FORM FEED key performs the operation. During operation, DATA LED blinks. The contents are as shown below: During operation, Δ and ∇ keys are disabled. After 30 sec of ON, automatically cancelled. RESET key can also cancel the mode. <table><tr><th>XXX</th><th>MC</th><th>GB</th><th>BS</th><th>TC</th></tr><tr><td>MCH</td><td>ON</td><td>HIGH</td><td>ON</td><td>—</td></tr><tr><td>MCL</td><td>ON</td><td>LOW</td><td>ON</td><td>—</td></tr><tr><td>TC+</td><td>ON</td><td>HIGH</td><td>ON</td><td>+</td></tr></table> MC : Main charge GB : Grid bias BS : DV bias TC : Transfer roller charge | XXX | MC | GB | BS | TC | MCH | ON | HIGH | ON | — | MCL | ON | LOW | ON | — | TC+ | ON | HIGH | ON | + | [FORM FEED] | After 30 sec of ON or [RESET] | | | | | | | | | | | | |
| XXX | MC | GB | BS | TC | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| MCH | ON | HIGH | ON | — | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| MCL | ON | LOW | ON | — | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| TC+ | ON | HIGH | ON | + | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

| Menu | Function | Execution | Cancel | | | | | | |
|------------|---|-------------|---------|----|---|-----|---|--|--|
| TEST PRINT | <p>Performs print test.</p> <p>The FORM FEED key performs the operation. During the operation, DATA LED blinks. During the operation, the number of sheets of print and the analog value of toner and heater are displayed in decimal number. Cancelled with the RESET key. During printing, cancellation is held and after printing, cancellation is performed. (Therefore, it takes a little time to stop operation.)</p> <p>Pressing the ENTER key shifts the mode to the setting menu of print test.</p> <p>Pressing the MENU key shifts the mode to the next menu.</p> | [FORM FEED] | [RESET] | | | | | | |
| | <p>J A M X X X</p> <p>Selection to check or not to check jam by feeding paper in test print.</p> <p>XXX is changed with Δ and ▽ keys.</p> <p>Pressing the MENU key shifts the mode to the next menu.</p> <p>Pressing the ENTER key shifts the mode to the test print menu.</p> <table><tr><th>XXX</th><th>Meaning</th></tr><tr><td>ON</td><td>Feeds paper, perform test print, and check jam.</td></tr><tr><td>OFF</td><td>Does not feed paper, does perform printing, and does not check jam.</td></tr></table> | XXX | Meaning | ON | Feeds paper, perform test print, and check jam. | OFF | Does not feed paper, does perform printing, and does not check jam. | | |
| XXX | Meaning | | | | | | | | |
| ON | Feeds paper, perform test print, and check jam. | | | | | | | | |
| OFF | Does not feed paper, does perform printing, and does not check jam. | | | | | | | | |
| | <p>H E A T E R X X X</p> <p>Selection of temperature control YES/NO.</p> <p>XXX is changed with Δ and ▽ keys.</p> <p>Pressing the MENU key shifts the mode to the next menu.</p> <p>Pressing the ENTER key shifts the mode to the test print menu.</p> <table><tr><th>XXX</th><th>Meaning</th></tr><tr><td>ON</td><td>Performs temperature control.</td></tr><tr><td>OFF</td><td>Does not perform temperature control. The heater is off.</td></tr></table> | XXX | Meaning | ON | Performs temperature control. | OFF | Does not perform temperature control. The heater is off. | | |
| XXX | Meaning | | | | | | | | |
| ON | Performs temperature control. | | | | | | | | |
| OFF | Does not perform temperature control. The heater is off. | | | | | | | | |
| | <p>M U L T I X X X</p> <p>Selection of multi print.</p> <p>XXX is changed with Δ and ▽ keys.</p> <p>Pressing the MENU key shifts the mode to the next menu.</p> <p>Pressing the ENTER key shifts the mode to the test print menu.</p> <table><tr><th>XXX</th><th>Meaning</th></tr><tr><td>ON</td><td>Printing is continued until the RESET key is pressed.</td></tr><tr><td>OFF</td><td>Only one sheet is printed.</td></tr></table> | XXX | Meaning | ON | Printing is continued until the RESET key is pressed. | OFF | Only one sheet is printed. | | |
| XXX | Meaning | | | | | | | | |
| ON | Printing is continued until the RESET key is pressed. | | | | | | | | |
| OFF | Only one sheet is printed. | | | | | | | | |

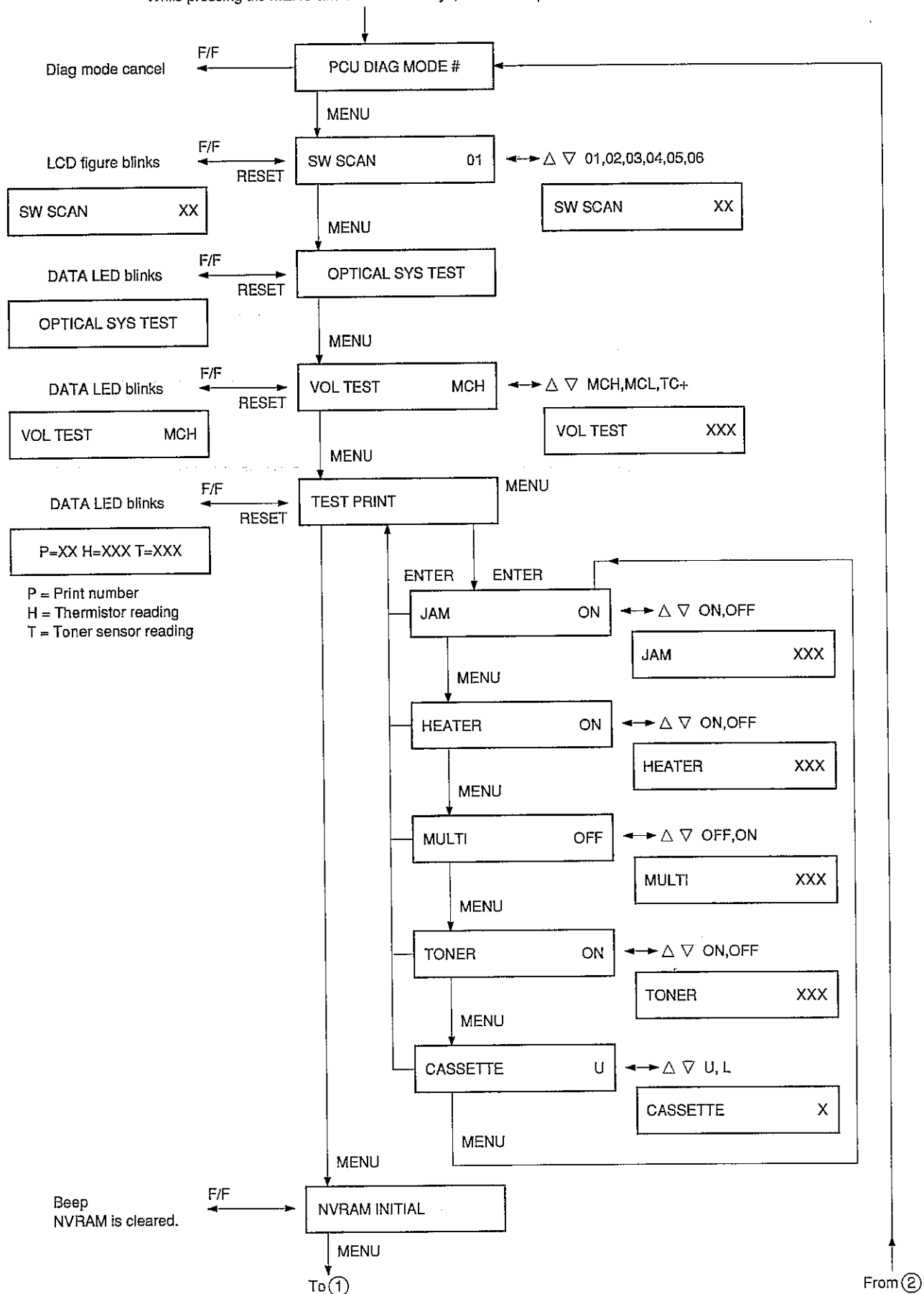
| Menu | Function | Execution | Cancel | | | | | | |
|--------------------------|---|-------------|-----------------------------------|----|---------------------------|-----|--------------------------|-------------|---------|
| <div>TEST PRINT</div> | <div>TONER XXX</div> <p>Selection of toner empty detection YES/NO. XXX is changed with Δ and ▽ keys. Pressing the MENU key shifts the mode to the next menu. Pressing the ENTER key shifts the mode to the test print menu.</p> <table><tr><th>XXX</th><th>Meaning</th></tr><tr><td>ON</td><td>Toner empty detection YES</td></tr><tr><td>OFF</td><td>Toner empty detection NO</td></tr></table> | XXX | Meaning | ON | Toner empty detection YES | OFF | Toner empty detection NO | [FORM FEED] | [RESET] |
| XXX | Meaning | | | | | | | | |
| ON | Toner empty detection YES | | | | | | | | |
| OFF | Toner empty detection NO | | | | | | | | |
| | <div>CASSET XXX</div> <p>Selection of paper tray for test print feeding. XXX is changed with Δ and ▽ keys to select the upper or lower tray. Pressing the MENU key shifts the mode to the jam menu. Pressing the ENTER key shifts the mode to the test print menu.</p> <table><tr><th>XXX</th><th>Meaning</th></tr><tr><td>U</td><td>Upper tray is selected.</td></tr><tr><td>L</td><td>Lower tray is selected.</td></tr></table> | XXX | Meaning | U | Upper tray is selected. | L | Lower tray is selected. | | |
| XXX | Meaning | | | | | | | | |
| U | Upper tray is selected. | | | | | | | | |
| L | Lower tray is selected. | | | | | | | | |
| <div>NVRAM INITIAL</div> | <p>NVRAM initializing. All the counter values and flags of NVRAM are cleared. After completion of the operation, a beep sound is generated. Pressing the MENU key shifts the mode to the counter set.</p> | [FORM FEED] | After completion of the operation | | | | | | |
| <div>COUNTER SET</div> | <p>Counters values setting. After completion of the operation, a beep sound is generated. Pressing the ENTER key shifts the mode to the counter setting menu. Pressing the MENU key shifts the mode to the version displaying menu.</p> <div>DEV XXXXX</div> <p>Setting of the upper three bytes of the five bytes of the counter of print number for the developer cartridge. The upper three bytes blink. Counts up with Δ key. Counts down with ▽ key.</p> <div>DEV XXXXX</div> <p>Setting of the lower two bytes of the five bytes of the counter of print number for the developer cartridge. The lower two bytes blink. Counts up with Δ key. Counts down with ▽ key.</p> | [FORM FEED] | After completion of the operation | | | | | | |

| Menu | Function | Execution | Cancel |
|------------------------|---|-------------|-----------------------------------|
| <div>COUNTER SET</div> | <div> <div>DRM XXXXX</div> Setting of the upper three bytes of the five bytes of the counter of print number for the drum cartridge. The upper three bytes blink. Counts up with v key. Counts down with w key. </div> <div> <div>DRM XXXXX</div> Setting of the lower two bytes of the five bytes of the counter of print number for the drum cartridge. The lower two bytes blink. Counts up with Δ key. Counts down with ▽ key. </div> <div> <div>DEVTM XXXXX</div> Setting of the upper three bytes of five bytes of the time of toner motor rotation for the developer cartridge. The upper three bytes blink. Counts up with Δ key. Counts down with ▽ key. </div> <div> <div>DEVTM XXXXX</div> Setting of the lower two bytes of the five bytes of the time of toner motor rotation for the developer cartridge. The lower two bytes blink. Counts up with Δ key. Counts down with ▽ key. </div> <div> <div>DRMTM XXXXX</div> Setting of the upper three bytes of five bytes of the time of toner motor rotation for the drum cartridge. The upper three bytes blink. Counts up with Δ key. Counts down with ▽ key. </div> <div> <div>DRMTM XXXXX</div> Setting of the lower two bytes of five bytes of the time of toner motor rotation for the drum cartridge. The lower two bytes blink. Counts up with Δ key. Counts down with ▽ key. </div> | [FORM FEED] | After completion of the operation |

| Menu | Function | Execution | Cancel |
|-------------|--|-------------|-----------------------------------|
| COUNTER SET | <div data-bbox="154 1207 192 1564">L I F E X X X</div> <p>Life counter setting The rounded value of the drum cartridge print number in the unit of 1024 is displayed when the drum cartridge is replaced. Counts up with Δ key. Counts down with ∇ key.</p> | [FORM FEED] | After completion of the operation |
| | <div data-bbox="369 1207 408 1564">T N L X X X</div> <p>Toner level setting. Counts up with Δ key. Counts down with ∇ key. Pressing the MENU key shifts the menu to the developer life counter upper byte setting menu.</p> | | |

5. Diag mode state transition

While pressing the MENU and the ENTER keys, turn on the power.



[11] TROUBLESHOOTING

Troubleshooting (A) is for printing problems, and troubleshooting (B) is for error codes.

(A) Printer troubleshooting

1. White line appearing vertically on print

■ Appearance of white streak or band in the paper feeding direction

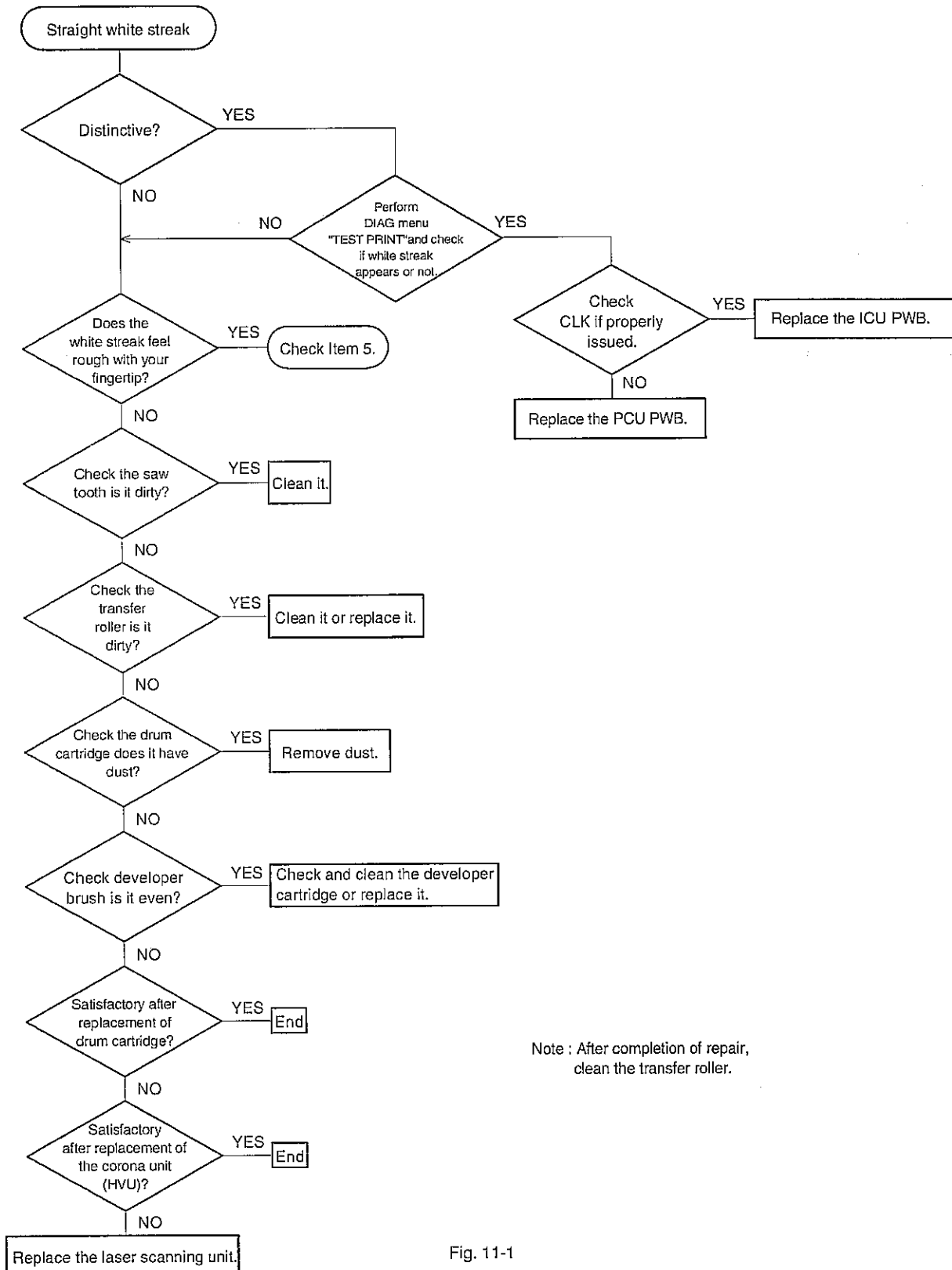
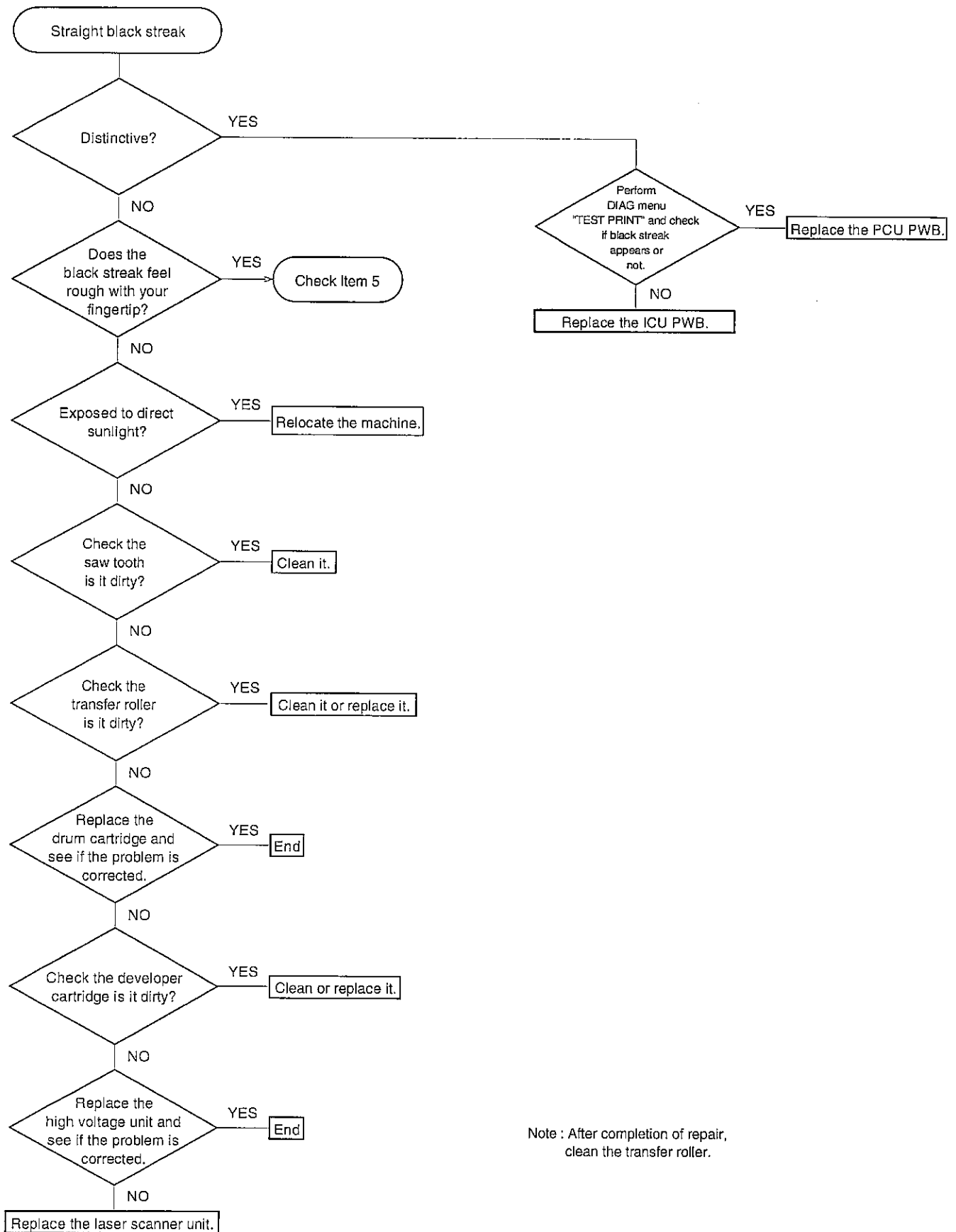


Fig. 11-1

2. Black line appearing vertically on print

■ Appearance of black streak or band in the paper feeding direction

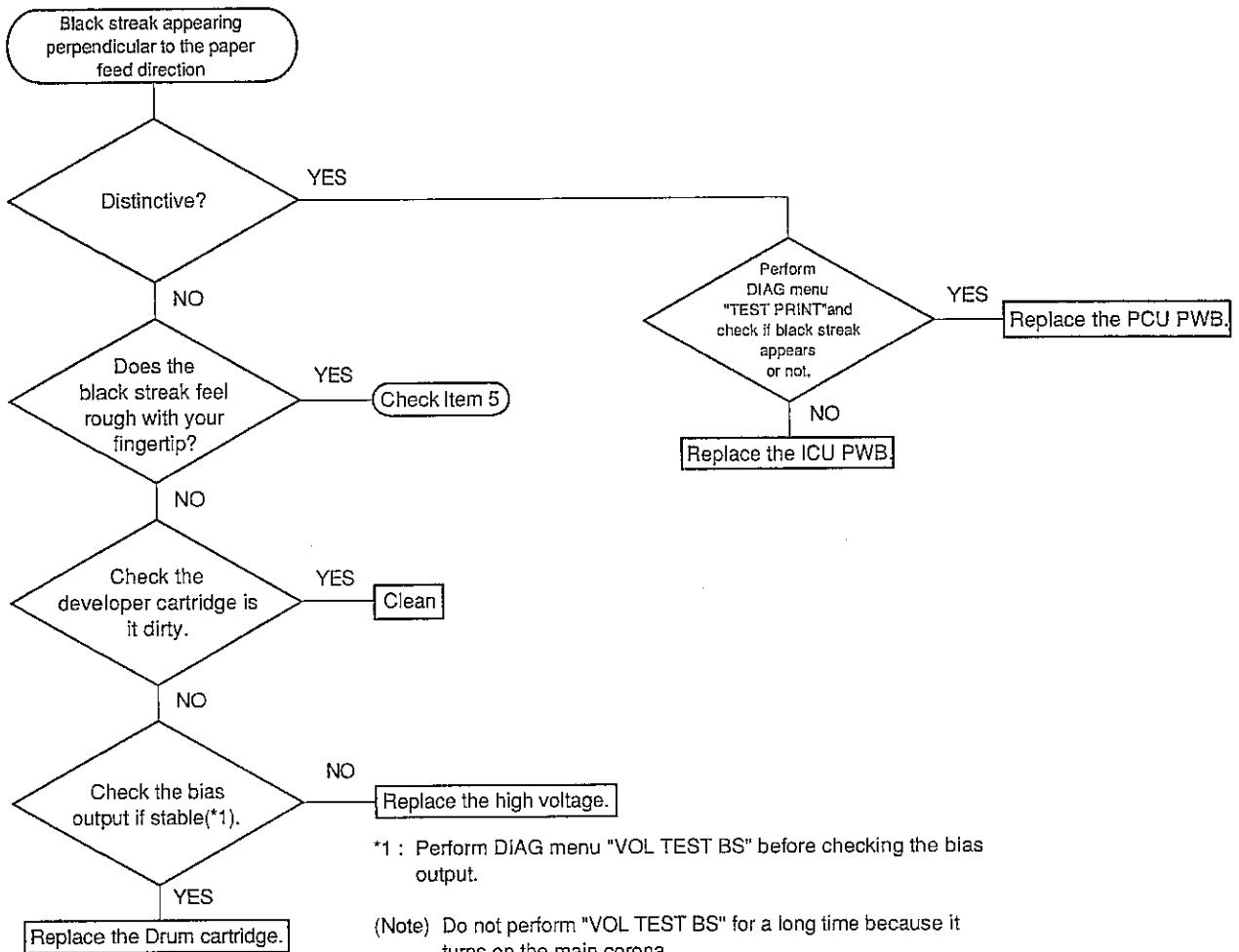


Note : After completion of repair,
clean the transfer roller.

Fig. 11-2

3. Black line appearing horizontally on print

- Appearance of black streak or band perpendicular to the paper feeding direction



*1 : Perform DIAG menu "VOL TEST BS" before checking the bias output.

(Note) Do not perform "VOL TEST BS" for a long time because it turns on the main corona.
Complete the measurement in a few seconds.

Note : After completion of repair,
clean the transfer roller.

Fig. 11-3

4. Poor fusing

- Printed image felt rough and toned image easily wiped away with your fingertip

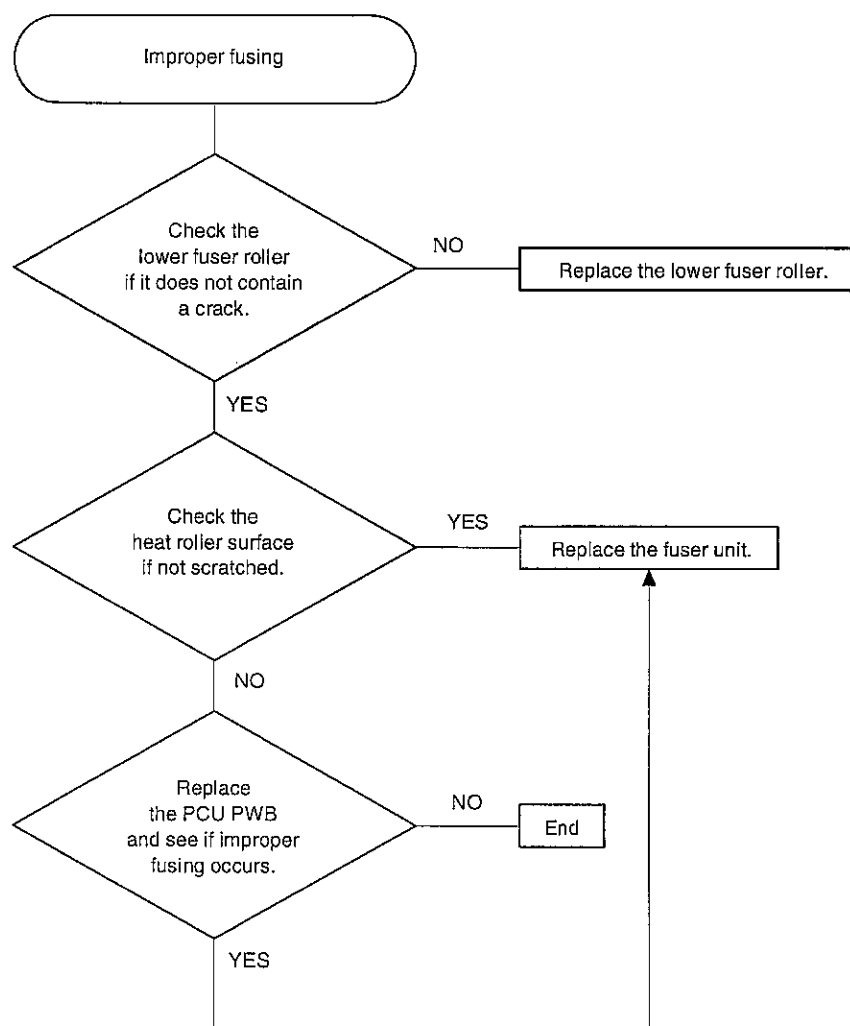


Fig. 11-4

5. Carrier transferred onto the drum surface

- Printed image felt rough and toned image easily wiped away with your fingertip

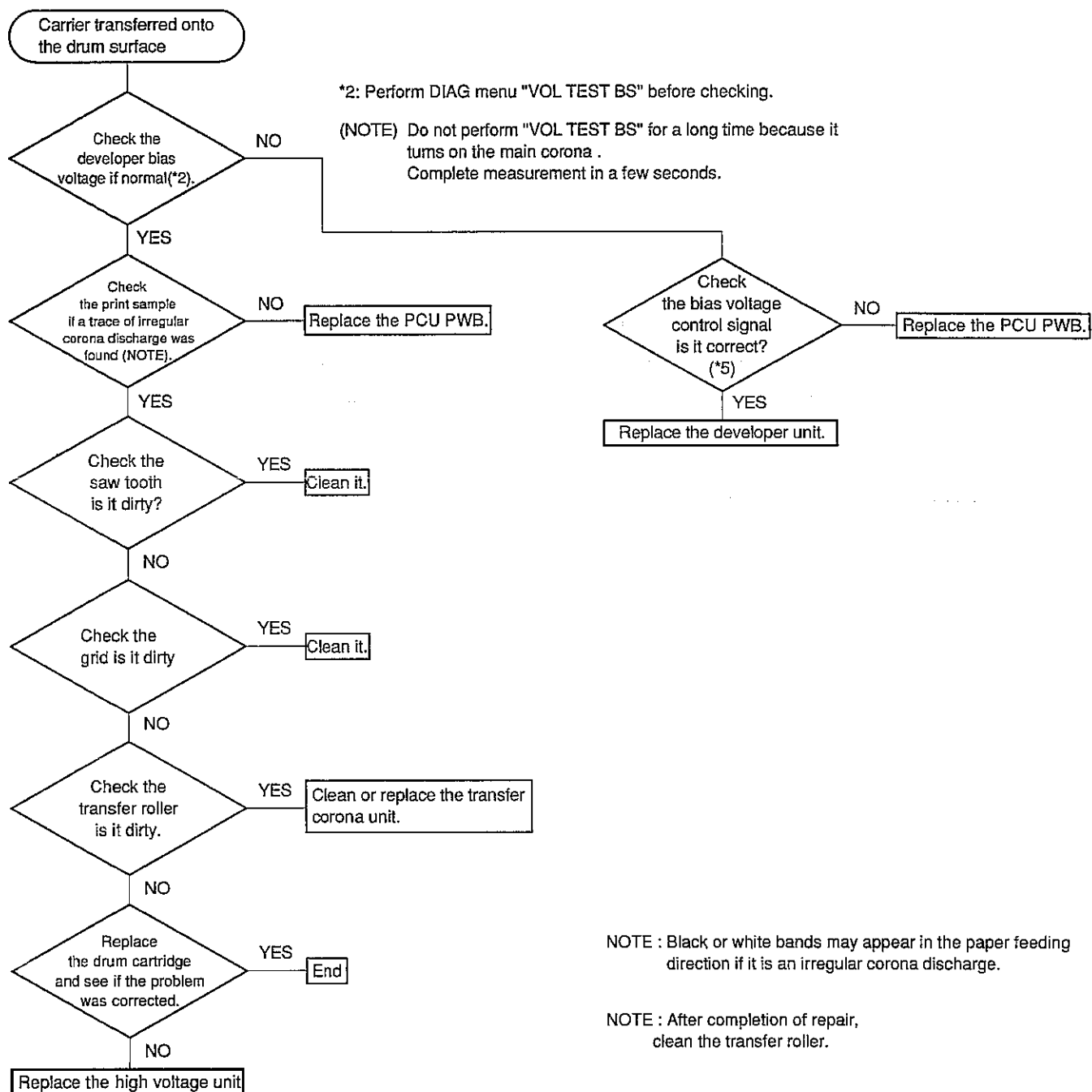
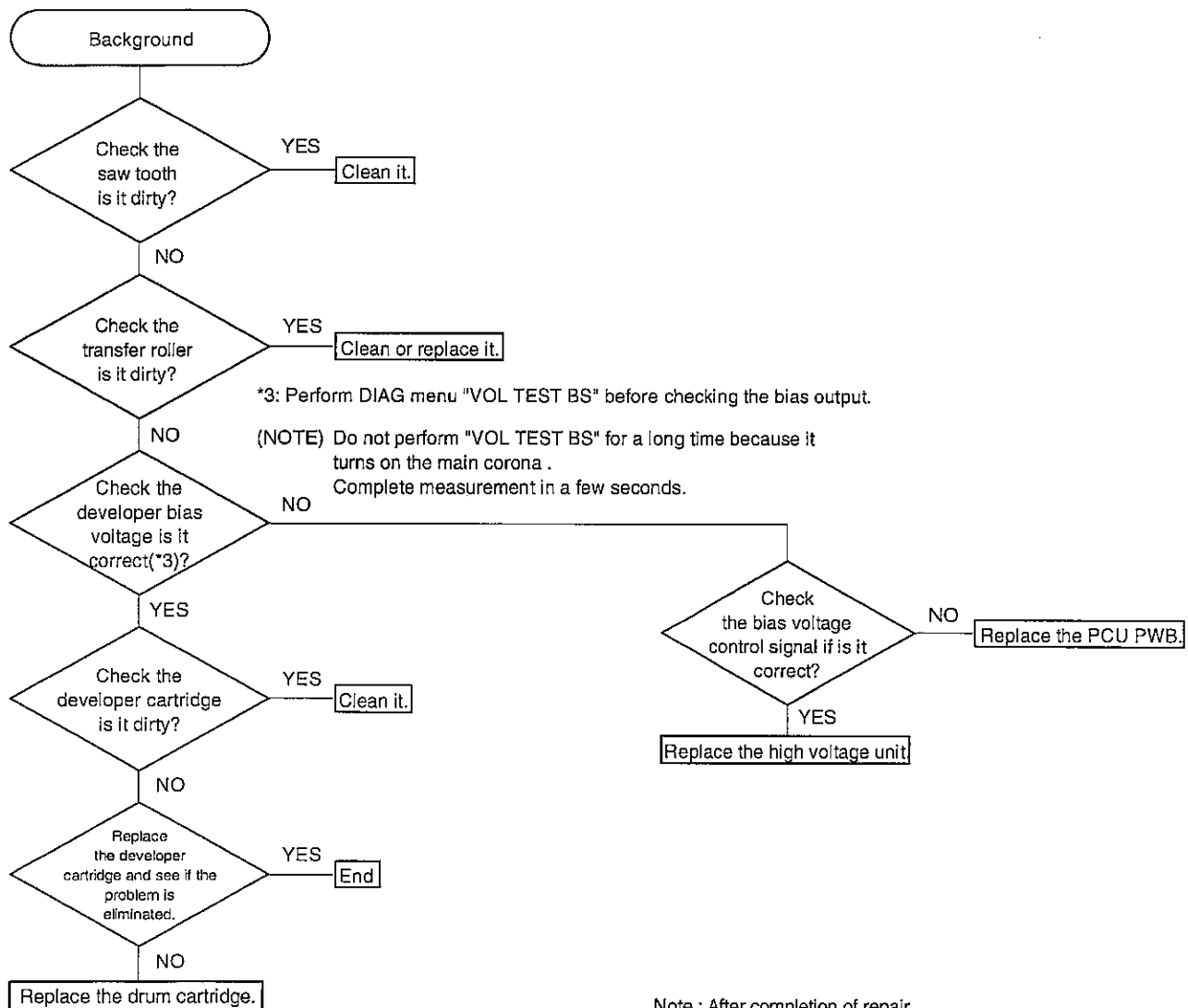


Fig. 11-5

6. Background

■ Background copied on a part or on the entire area of print



Note : After completion of repair,
clean the transfer roller.

Fig. 11-6

7. Lack of print density

■ Extremely light print density

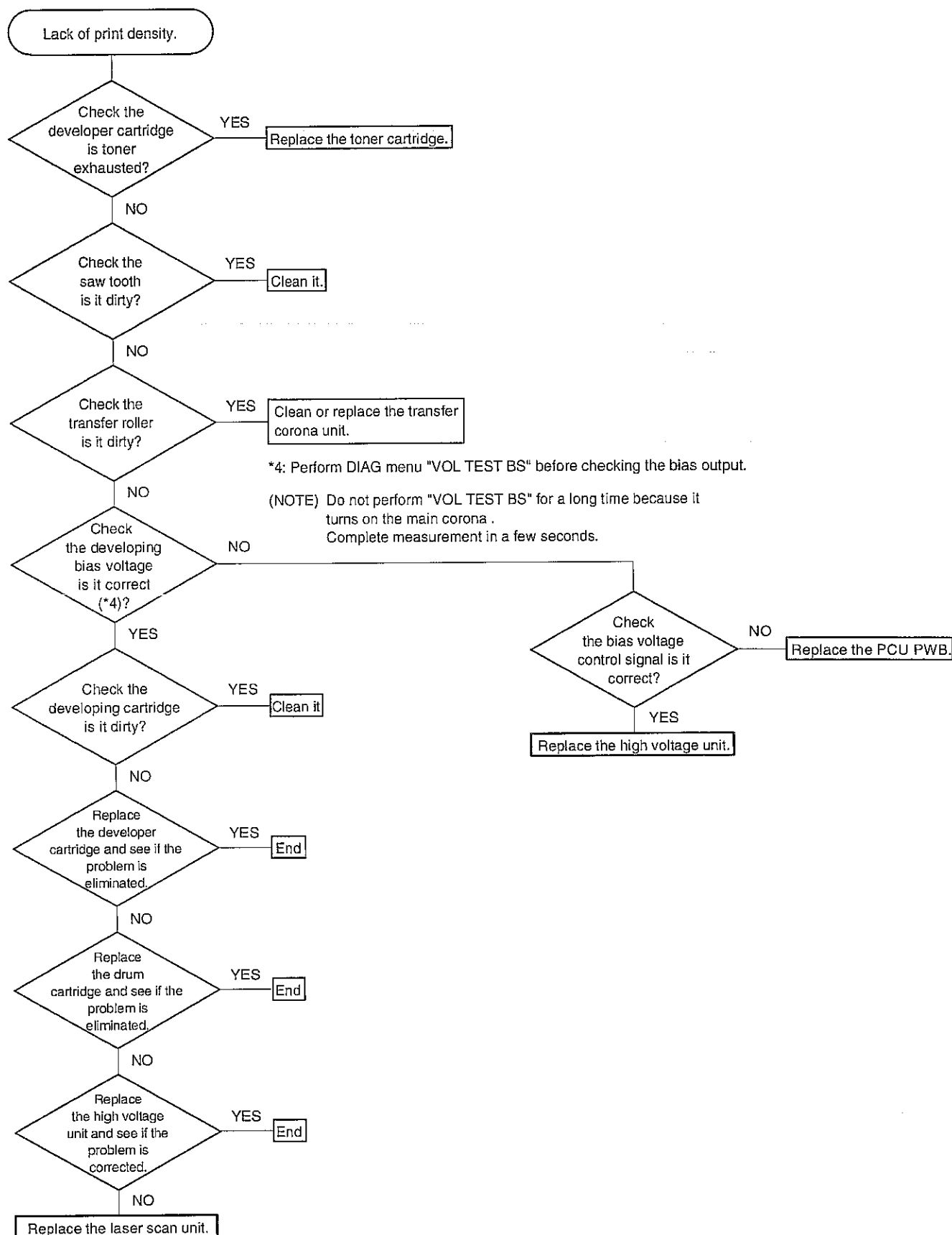


Fig. 11-7

(B) Troubleshooting for error code

1. Operator call error

| Error Message | Description | Recover |
|-------------------------------------|---|--|
| INPUTBUFFER FULL | The host computer ignores the printer's busy state and continues to send data. | Check the protocol signal line between the printer and the host computer or adjust the setting. Press the CONTINUE/RESET key. |
| COVER OPEN | Front cover of printer is not closed properly. | Close the front cover firmly and check that it is properly latched. Press the CONTINUE/RESET key. |
| INTERFACE ERROR | RS-232C interface error (For example, framing error) | Check the RS-232C interface function and execute it again. Press the CONTINUE/RESET key. |
| DATA LOSS ERROR | Too many characters on one line | Delete excess characters and execute again. Press the CONTINUE/RESET key. |
| PAPER OUT *** (***) = UPPER, LOWER) | Paper empty or paper cassette removed. | Add paper or replace the paper cassette. If the paper size matches the previous setting, the printer will return online. |
| PAPER JAM | Paper is jammed. | Check the cassette, open the front and top covers, and remove the misfed paper. Press the CONTINUE/RESET key. |
| TONER LOW | Near end of toner/developer cartridge life. | Automatically cleared. |
| REPL. TONER | End of toner/developer cartridge life. | Replace the toner/developer cartridge. |
| DRUM NEAR END | Near end of photoconductor cartridge life. | Automatically cleared. |
| REPL. DRUM | End of photoconductor cartridge life. | Replace the photoconductor cartridge. |
| DATA MEMORY FULL | Printer memory cannot accommodate soft fonts or other data included with the print job. May be caused by font rotation, i.e. specifying an orientation different from that of the font card. | First press the CONTINUE/RESET key. Then, decrease occupied memory space by decreasing number of soft fonts or eliminating font rotation. When you press the CONTINUE/RESET key, the soft font or macro entered prior to going offline is deleted. If you press and hold the CONTINUE/RESET key until "RESET" appears on the display, all temporary soft fonts and macros are deleted. |
| EEPROM ERROR | Did you turn off power while setting parameters? Check to see again if the setting is correct. | Press the CONTINUE/RESET key and then set the parameters again. |

2. Service engineer call error

<Error type>

- a. P1 to P4: A fault in the PCU (Process control unit)
- b. C1 to C6: Printer mechanism fault.
- c. E1 to E5: A fault in the ICU (Interface control unit)

| Display | Meaning |
|-----------------|-------------------------------|
| SERVICE (E1) | ICU ROM Checksum Error |
| SERVICE (E2) | ICU RAM Read/Write Error |
| SERVICE (E3) | Expansion Memory Error |
| SERVICE (E4) | ICU Hardware Read/Write Error |
| SERVICE (E5) | EE-PROM Checksum Error |
| SERVICE (E6-E9) | (Reserved) |
| SERVICE (FC) | Font card Error |

| Display | Meaning |
|-----------------|-----------------------------|
| SERVICE (P1) | PCU ROM Checksum Error |
| SERVICE (P2) | PCU RAM Read/Write Error |
| SERVICE (P3) | Non-volatile RAM Read Error |
| SERVICE (P4) | Serial Communication Error |
| SERVICE (P5-P6) | (Reserved) |

| Display | Meaning |
|-----------------|-------------------------|
| SERVICE (C1) | Optical System Error |
| SERVICE (C2) | Driving Motor Defective |
| SERVICE (C3) | Polygon Motor Defective |
| SERVICE (C4) | High Heater Temperature |
| SERVICE (C5) | Low Heater Temperature |
| SERVICE (C6) | Thermistor Open |
| SERVICE (C7-C9) | (Reserved) |

<Error check point>

| | Cause | Error description | | Action |
|----|-------------------------------------|--|-------------------------------|---|
| | COVER OPEN | 1) Check that the transport unit is closed. 2) Check that the drum cartridge is installed. 3) Check that PCU IC4 18pin is HIGH. | No No Yes No | 1) Close the transport unit. 2) Insert the drum cartridge. 3) Replace the CPU. 4) Defective contact. |
| | PAPER JAM | 1) Check that paper is discharged from the machine. 2) Check that the paper-entry sensor actuator is not hung. 3) Check that the paper-exit sensor actuator is not hung. 4) Turn on/off the actuator to check that PCU IC4 21pin and 22pin levels change. | No Yes Yes No Yes | 1) Discharge paper. 2) Replace the paper-entry sensor. 3) Replace the paper-exit sensor. 4) Defective contact. Replace the CPU. |
| | PAPER OUT | 1) Check that paper is in the cassette. 2) Check that the paper empty sensor is not hung. 3) Turn on/off the actuator and check that CS-PWB IC1 1pin and 12pin levels change. | No Yes No Yes | 1) Supply paper in the cassette. 2) Replace the paper empty sensor. 3) Defective contact. Replace IC1. |
| P1 | PCU ROM Sumcheck error | Check the CPU if the correct one is used. | Yes | Replace the CPU (M37451) with a new one. |
| P2 | PCU RAM Sumcheck error | Check the CPU if the correct one is used. | Yes | Replace the CPU (M37451) with a new one. |
| P3 | NVRAM read error | Check the CPU, if operating normally. CE received at power on. | No Yes | Replace the CPU (M37451) with a new one. Replace IC1 (PCU) with a new one. |
| P4 | Serial communication error | 1) Check that STS signal is normally supplied from CPU (M37451) 3pin to ICU. 2) Check that CMD signal is normally supplied to CPU (M37451) 4pin. | No No | Replace the CPU (M37451) with a new one. Check ICU and MD-PWB. |
| C1 | Optional system error | 1) Check VIDEO if received correctly. 2) Check that SYNC is normally supplied to CPU (M37451) 24pin. | No No | Replace the CPU (M37451) with a new one. Replace LSU with a new one. |
| C2 | Main motor failure | 1) Check that the main motor rotates. 2) Check +24VH if properly supplied. 3) Check MMDA, MMDA \bar{A} , MMD \bar{B} , MMD \bar{B} if properly received when the motor is on. | Yes No No Yes | Replace the developer cartridge. Replace the power supply unit with a new one. Replace the CPU (M37451) with a new one. Replace the MD-PWB with a new one. |
| C3 | Polygonal motor failure | 1) Check +24VH if properly supplied. 2) Check PMD if correctly received when the polygonal motor is on. 3) Check PMTLK if issued properly when the polygonal motor is on. | No No No | Replace the power supply unit with a new one. Replace IC6 (PCU) with a new one. Replace the optical unit with a new one. |
| C4 | Irregularly high heater temperature | 1) Check the resistance across the thermistor if 100K Ω at room temperature of 25°C. 2) Check HLON if properly issued, not always at a low. 3) Check that a voltage is always applied to the heater. | No No No | Replace the thermistor with a new one. Replace IC5 (PCU) with a new one. Replace the power supply with a new one. |
| C5 | Irregularly low heater temperature | 1) Check the resistance across the thermistor if 100K Ω at room temperature of 25°C. 2) Check HLON if at a low during warmup. 3) Check that a voltage is applied to the heater. | No No No | Replace the thermistor with a new one. Replace IC5 (PCU) with a new one. Replace the power supply with a new one. |
| C6 | Thermistor open | 1) Check the resistance across the thermistor if 100K Ω at room temperature of 25°C. | No Yes | Replace the thermistor with a new one. Replace the CPU (M37451) with a new one. |
| E1 | ICU ROM sumcheck error | 1) Check the ROM chip if correct. | No | Replace the ROM chip with a new one. |
| E2 | ICU RAM read/write error | 1) Check the RAM chip if correct. | No | Replace the RAM chip with a new one. |
| E3 | Expansion memory read/write error | 1) Check the expansion memory if correct. | No | Replace the expansion memory with a new one. |
| E4 | ICU hardware error | | | Replace the ICU with a new one. |
| E5 | ICU EE-PROM sumcheck error | 1) Initialize the EE-PROM. (Setting for the destination) | | Replace the EEROM with a new one. |

[12] PROCESS CONTROL UNIT (PCU) CIRCUIT DESCRIPTION

1. Outline of PCU

The PCU performs the control of the printer engine and interfaces with ICU and OPU.

Block diagram

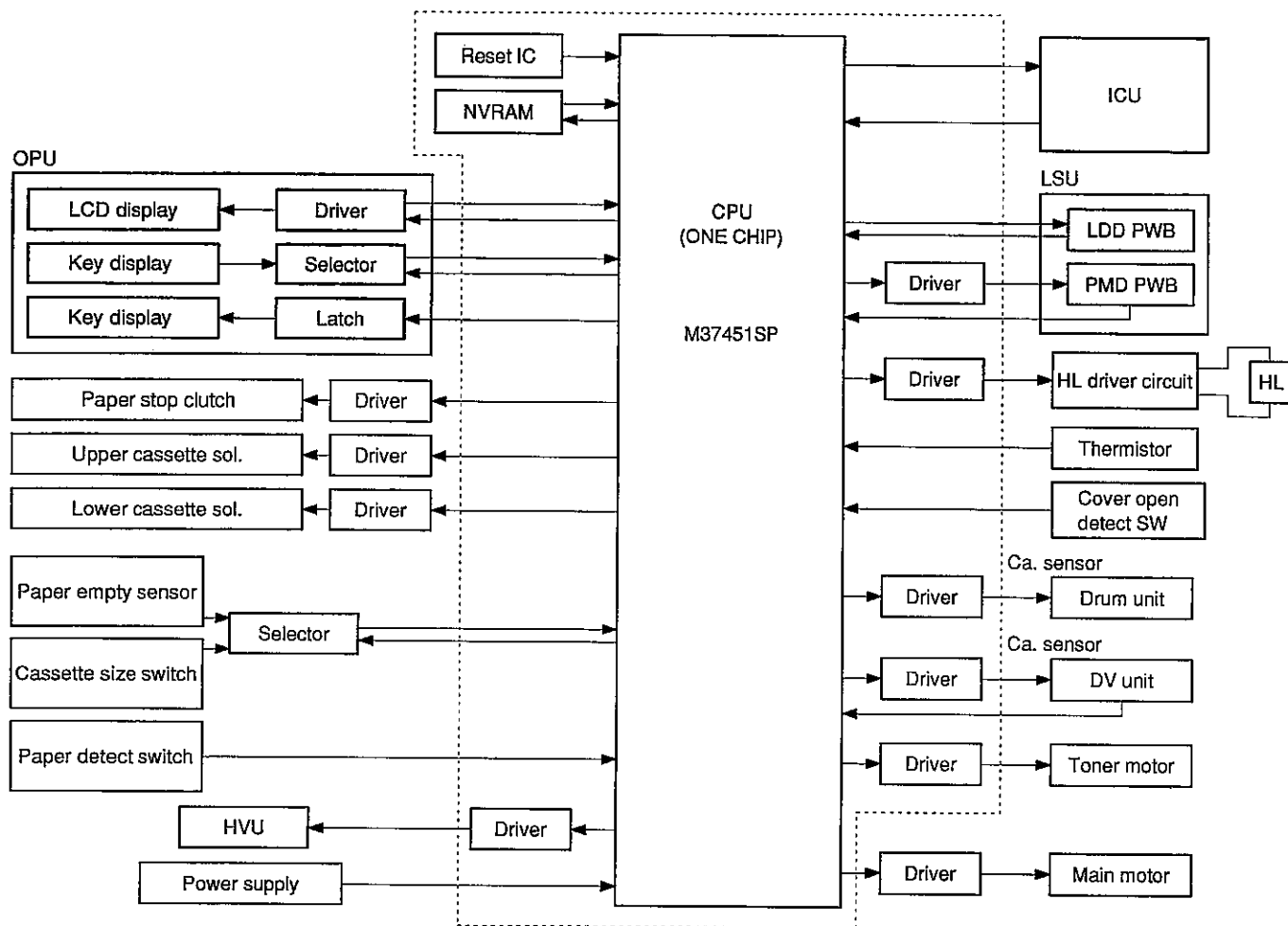
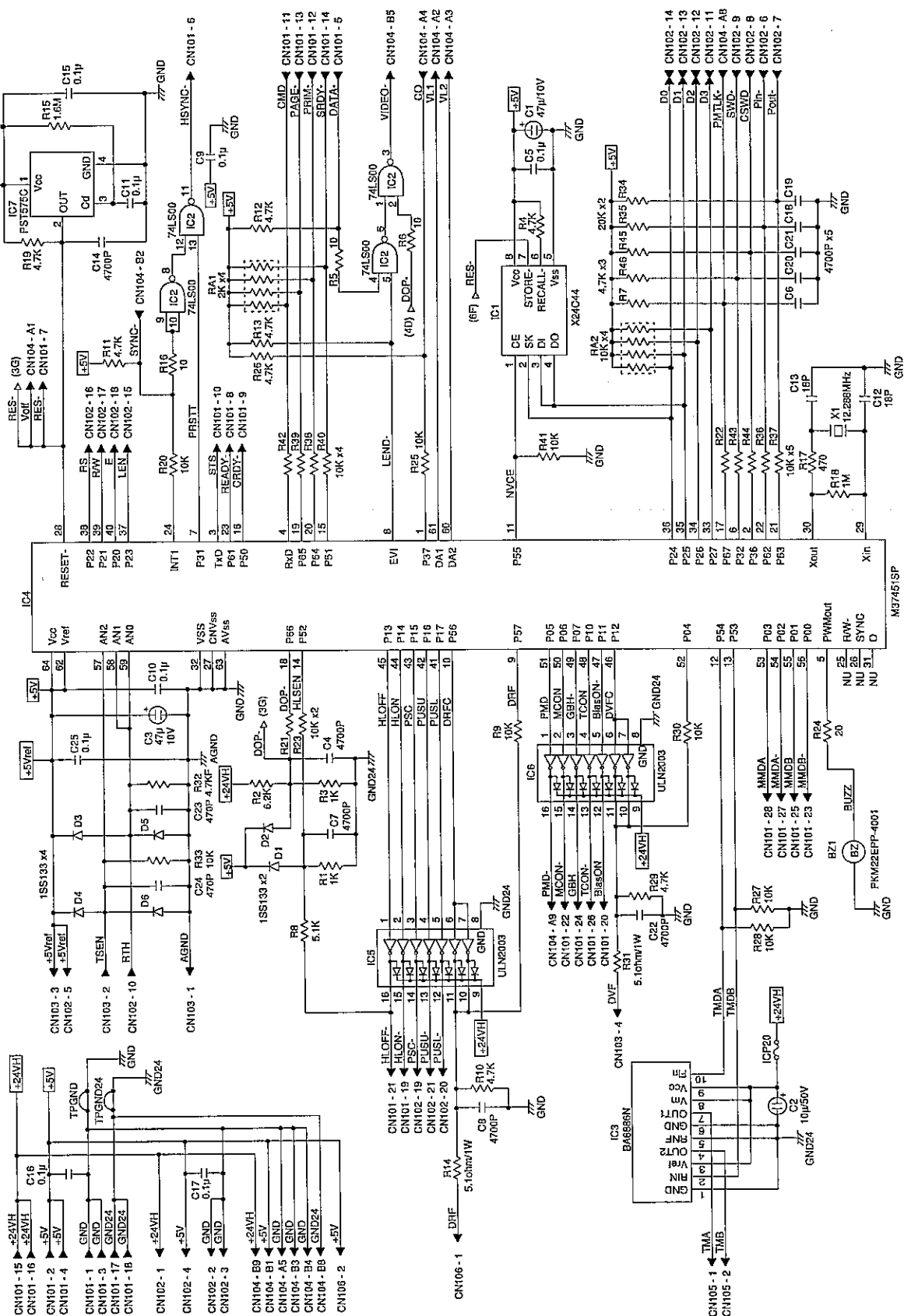


Fig. 12-1-A

Fig. 12-1-B



1-1. CPU (M37451MS)

The M37451MS used in the PCU is an 8-bit single-chip microcomputer which includes 16-byte ROM and 384-byte RAM, three 16-bit timers, one serial I/O, three channels of 8-bit AD convertor, two channels of 8-bit DA convertor, forty eight I/O ports.

This CPU is used in the single chip mode.

CPU Terminal arrangement

| Pin No. | In/Out | Signal name | Function |
|---------|--------|-------------|--|
| 1 | I | CO | Laser power control signal |
| 2 | I | CSWD | Cassette size, paper out detect signal |
| 3 | O | STS | Status output signal to ICU |
| 4 | I | CMD | Command input signal from ICU |
| 5 | O | BUZZ | Buzzer signal |
| 6 | I | SWD | Key input signal from OPU |
| 7 | O | PRSTT | Print start signal |
| 8 | O | LEND | Line end signal |
| 9 | I | DRF | Drum unit cartridge sensor detect signal, H: New Drum |
| 10 | O | DRFC | Drum unit cartridge sensor cut signal, H: sensor cut |
| 11 | O | NVCE | NVRAM chip enable signal |
| 12 | O | TMDA | Toner motor drive signal |
| 13 | O | TMDB | Toner motor drive signal |
| 14 | I | HLSN | Heater lamp control abnormal detect signal |
| 15 | I | SRDY | Status ready signal from ICU |
| 16 | O | CRDY | Command ready signal to ICU |
| 17 | I | PMTLK | Polygon motor lock signal |
| 18 | I | DOP | Cover open detect signal |
| 19 | I | PAGE | Print action start signal from ICU |
| 20 | I | PRIM | PCU initialize request signal from ICU |
| 21 | I | Pout | Paper exit sensor signal |
| 22 | I | Pin | Pin sensor signal |
| 23 | O | READY | Print ready signal to ICU |
| 24 | I | SYNC | Horizontal synchronous signal |
| 25 ~ 26 | — | — | NC |
| 27 | — | CNVss | GND |
| 28 | — | RES | CPU reset signal |
| 29 | I | Xin | Clock input |
| 30 | O | Xout | Clock output |
| 31 | — | — | NC |
| 32 | — | Vss | GND |
| 33 ~ 36 | I/O | D3 ~ 0 | LCD control data bus, key signal address, NVRAM signal |
| 37 | O | LEN | LED control enable signal |
| 38 | O | RS | LCD control resistor selection signal |
| 39 | O | R/W | LCD control data read/write signal, H: read |
| 40 | O | E | LCD control data synchronous signal |
| 41 | O | PUSL | Lower paper feed solenoid control signal, H: PUSL ON |
| 42 | O | PUSU | Upper paper feed solenoid control signal, H: PUSU ON |
| 43 | O | PSC | Paper stopper clutch control signal, H: PSC ON |
| 44 | O | HLON | Heater lamp control signal, H: Heater lamp ON |
| 45 | O | HLOFF | Heater lamp control signal, H: Heater lamp OFF |
| 46 | O | DVFC | DV unit cartridge sensor cut signal, H: sensor cut |
| 47 | O | BiasON | Bias control signal, L: Bias ON |
| 48 | O | TCON | Transfer corona control signal, H: Transfer corona ON |
| 49 | O | GBH | Glid bias control signal, L: Glid bias HIGH |
| 50 | O | MCON | Main corona control signal, H: Main corona ON |
| 51 | O | PMD | Polygon motor drive signal, H: Polygon motor ON |
| 52 | I | DVF | DV unit cartridge sensor detect signal, H: New DV |
| 53 | O | MMDA | Main motor drive signal |
| 54 | O | MMDA | Main motor drive signal |
| 55 | O | MMDB | Main motor drive signal |
| 56 | O | MMDB | Main motor drive signal |
| 57 | I | TSEN | Toner sensor input signal (analog) |
| 58 ~ 59 | I | RTH | Thermistor input signal (analog) |
| 60 | O | VL2 | Laser power control signal (analog) |
| 61 | O | VL1 | Laser power control signal (analog) |
| 62 | — | Vref | +5V |
| 63 | — | AVss | GND |
| 64 | — | Vcc | +5V |

Table 12-1

1-2. NVRAM (X24C44)

The X24C44 is a CMOS RAM which includes CMOS static RAM and its relevant EEPROM. Its capacity is 16 words x 16 bits. Data is passed through one data bus.

When the STORE pin is LOW, all RAM data is passed to the EEPROM. When the recall signal is inputted, the EEPROM data is returned to the RAM. The RAM data can be read or written independently of this transmission.

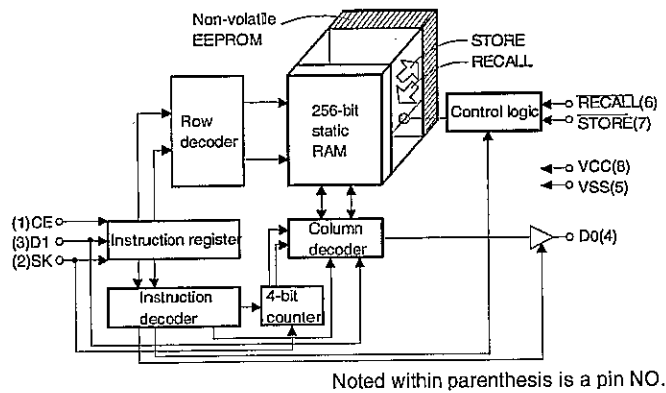


Fig. 12-2

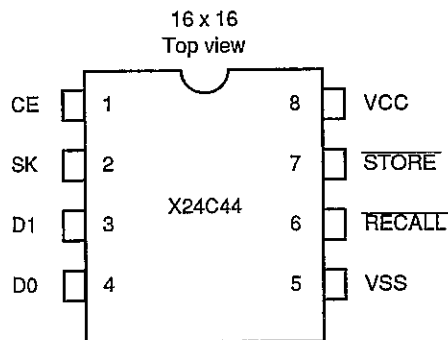


Fig. 12-3

| | |
|-----------------|------------------|
| CE | Chip enable |
| SK | Serial clock |
| D _i | Serial data, in |
| D _o | Serial data, out |
| RECALL | Recall |
| STORE | Store |
| V _{cc} | +5V |
| V _{ss} | GND |

Table 12-2-2

(Pin functions)

• Chip Enable (CE)

The Chip Enable input should be made HIGH when performing read or write. When CE is LOW, the instruction register is reset and X24C44 goes into the low power standby mode.

• Serial Clock (SK)

The Serial Clock is used for every input/output of the data.

• Data In (DI)

The Data In is used for serial data input.

• Data Out (DO)

The Data Out is used for serial data output.

This pin is kept at HIGH except when data are outputted according to a read command.

• STORE

When STORE pin is made LOW, data transmission from RAM to E²PROM is started.

• RECALL

When RECALL pin is made LOW, data transmission from E²PROM to RAM is started.

(NVRAM sequence)

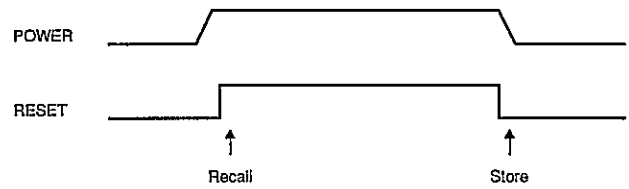


Fig. 12-3-2

1-3. Driver (ULN2003)

The ULN2003 is a transistor array composed of Darlington- paired transistors and the peripheral circuits.

ULN2003 pin configuration

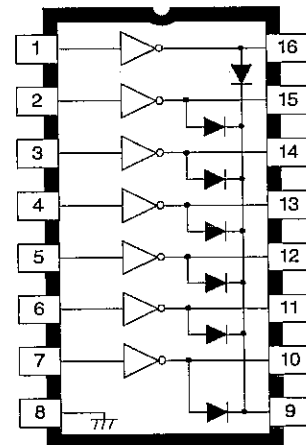


Fig. 12-4

[Equivalent circuit]

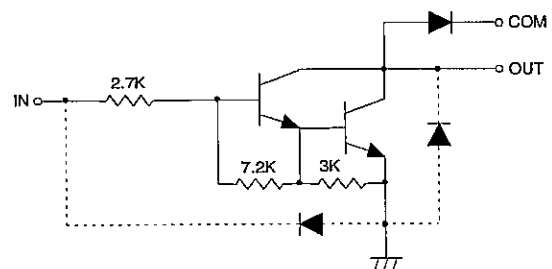


Fig. 12-5

1-4. Toner motor driver (BA6886N)

The BA6886N is a transistor array composed of H-bridge-connected transistors and the peripheral circuits.

[BA6886N block diagram]

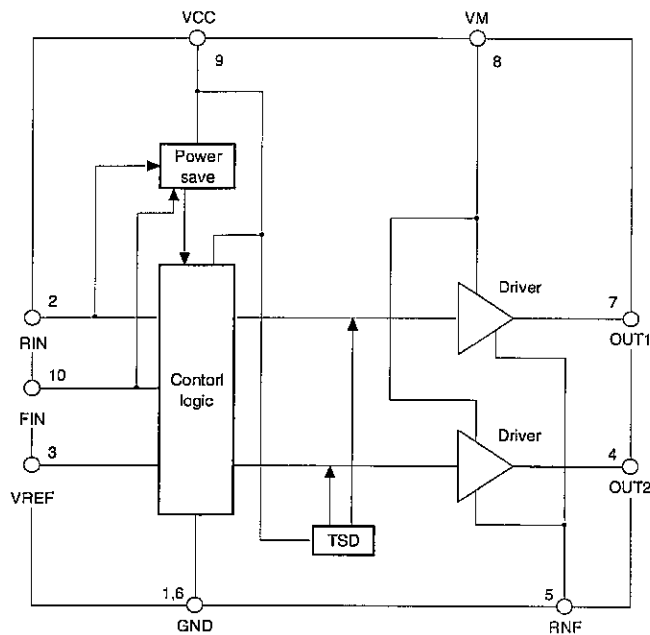


Fig. 12-6-1

(Pin location)

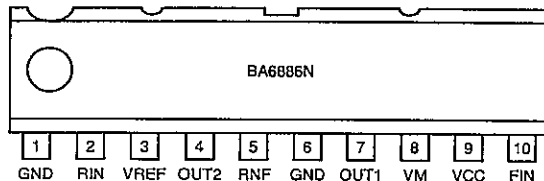


Fig. 12-6-2

(Pin functions)

| Pin No. | Pin Name | Functions |
|---------|------------------|---|
| 1 | GND | GND |
| 2 | R _{IN} | Logic input pin |
| 3 | V _{REF} | Output HIGH voltage setting pin |
| 4 | OUT2 | Motor output pin |
| 5 | R _{NF} | Output section GND, Output current detecting resistor connection pin. |
| 6 | GND | GND |
| 7 | OUT1 | Motor output pin |
| 8 | V _n | Motor section power |
| 9 | V _{cc} | Power pin |
| 10 | F _{IN} | Logic input pin |

Table 12-2-2

(I/O truth value table)

| F _{IN} | R _{IN} | OUT 1 | OUT 2 | Mode |
|-----------------|-----------------|-------|-------|---------|
| H | L | H | L | Normal |
| L | H | L | H | Reverse |
| H | H | L | L | Brake |
| L | L | OPEN | OPEN | Standby |

Table 12-6-3

1-5. Main motor driver (SLA7024M)

The SLA7024M is a stepping motor driven by the uni-polar constant current.

[Block diagram]

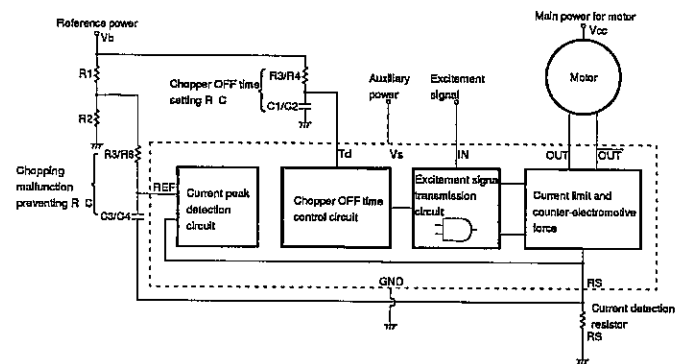
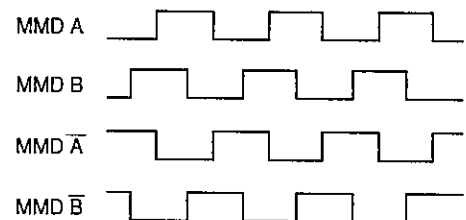


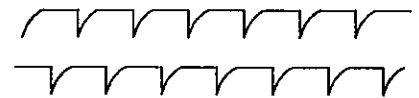
Fig. 12-7-1

[Motor driver SLA7024M control signal]

Input signal



Output current



* The current waveforms will vary according to the load torque.

Fig. 12-7-2

[Equivalent circuit]

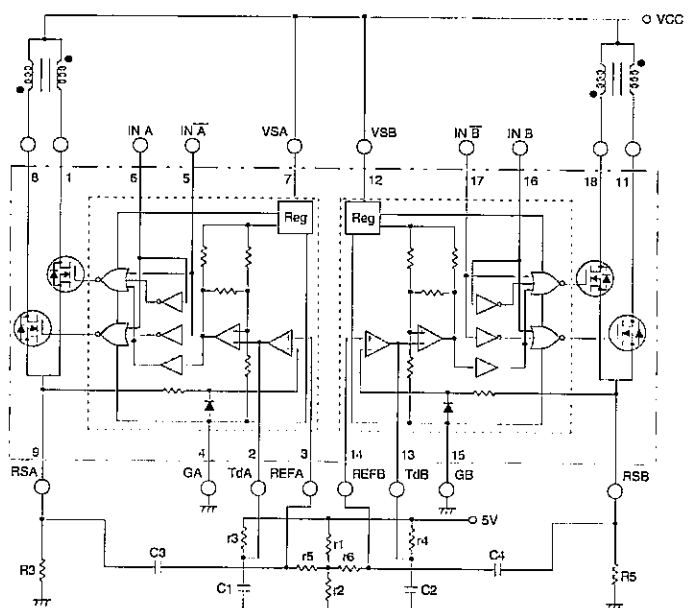


Fig. 12-7-3

1-6. Printer engine control

The printer state is detected by the input circuit and each section is controlled to perform printing.

(1) Engine status input circuit

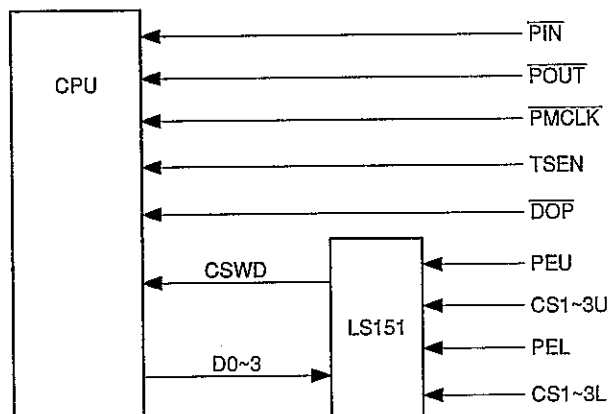


Fig. 12-8

- P_{in}: Paper-in sensor. Senses paper presence inside the body (in front of the PS roller) at LOW.
- P_{out}: Paper-out sensor. Senses paper presence inside the body (in the paper exit side from the fuser section) at LOW.
- P_{MCLK}: Polygon motor lock signal. Senses that the polygon motor has reached a constant speed at LOW.
- TSEN: Analog signal from the toner sensor.
- DOP: When the cover is opened, the voltages (+24V) which are regarded as dangerous for the user, such as the motor, are cut off by the safety switch. The PCU detects it by dividing +24V.
- CSWD: Multiplexed signal of PEU-CS1 - 3U-PEL-CS1 - 2L.
- PEU: Sensor output which shows paper empty in the upper cassette. (Empty at HIGH.)
- PEL: Sensor output which shows paper empty in the lower cassette. (Empty at HIGH.)
- CS1 ~ 3U: Senses paper size in the upper cassette. (Push the main body switch in the projection at the right side of the cassette.)
- CS1 ~ 3L: Senses paper size in the lower cassette. (Push the main body switch in the projection at the right side of the cassette.)

| CS1U, CS1L | CL2U, CS2L | CS3U, CS3L | Paper size |
|------------|------------|------------|------------|
| L | L | L | NO TRAY |
| L | L | H | LEGAL |
| L | H | L | LETTER |
| L | H | H | — |
| H | L | L | ENVELOPE |
| H | L | H | A4 |
| H | H | L | — |
| H | H | H | — |

Table 12-3

(2) Output circuit

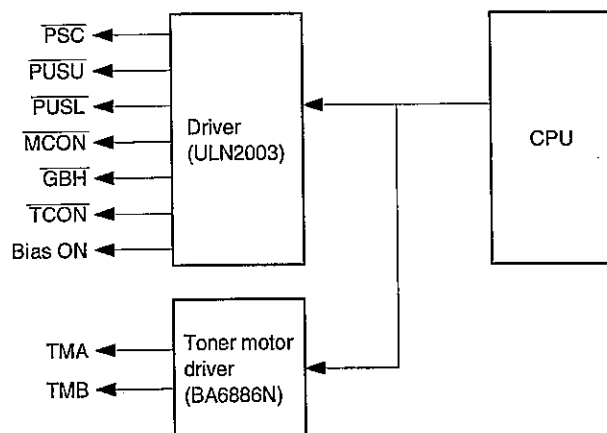


Fig. 12-9

- P_{SC}: Paper strap clutch ON signal. (ON at LOW.)
- P_{USU}: Upper cassette paper pick up solenoid ON signal. (ON at LOW.)
- P_{USL}: Lower cassette paper pick up solenoid ON signal. (ON at LOW.)
- M_{CON}: Main corona control signal. (ON at LOW.)
- G_{BH}: Grid bias voltage control signal. (High at HIGH, low at LOW.)
- T_{CON}: Transfer corona control signal. (ON at LOW.)
- BiasON: Developer bias control signal. (ON at HIGH.)
- TMA, TMB: Toner motor (synchronous motor) drive signal

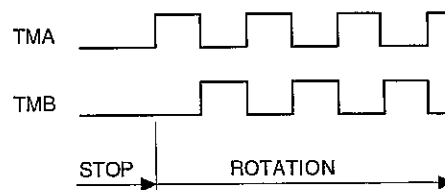


Fig. 12-10-A

Interface with PCU (PCU - High voltage unit)

| Control signal | MC output | TC+ output | TC- output | BS output | GBhigh output | GBlow output |
|----------------|------------|------------|------------|------------|---------------|--------------|
| MCON | low active | low active | low active | low active | low active | low active |
| TCON | X | low active | X | X | X | X |
| BSON | X | X | X | hi active | X | X |
| GBH | X | X | X | X | X | low active |

X = Arbitrary state

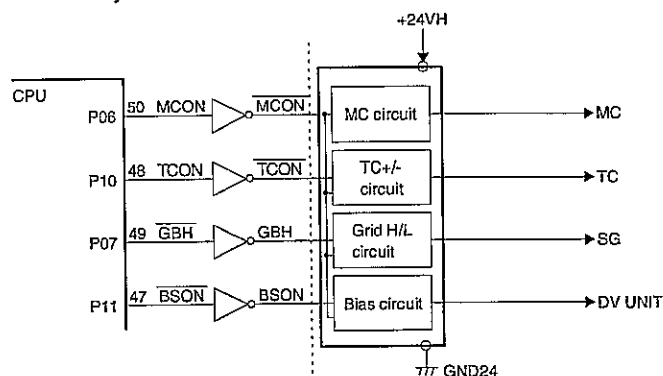


Fig. 12-10-B

(3) User maintenance parts control

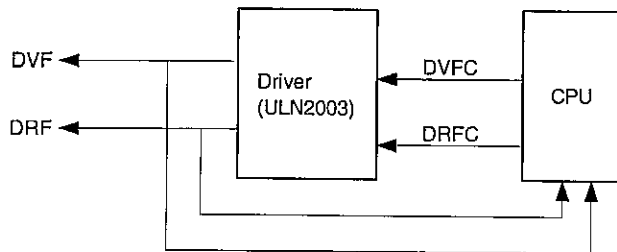


Fig. 12-11

DVF: DV cartridge NEW sense signal. (NEW at HIGH.)

DVFC: DV cartridge cartridge sensor cut signal. (Cut at HIGH.)

DRF: Drum cartridge NEW sense signal. (NEW at HIGH.)

DRFC: Drum cartridge sensor cut signal. (Cut at HIGH.)

NEW sense in each cartridge

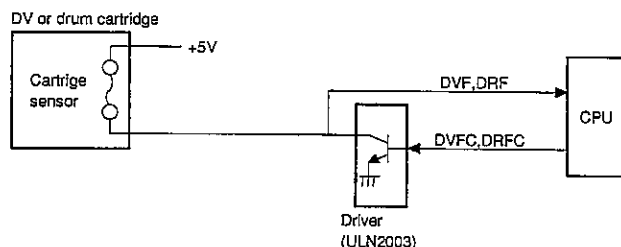


Fig. 12-12

When DVF or DRF is HIGH, the CPU senses NEW of each cartridge and resets the counter. Then DVFC or DRFC is driven to HIGH to cut the cartridge sensor operation.

When the cartridge sensor operation is cut off, DVF or DRF signal becomes LOW.

(4) Output control with input

Heater lamp control

The voltage divided by the thermistor on the fuser roller and R32 (4.7kF) of the PCU are inputted to AN0 and AN1 ports to detect the surface temperature of the fuser roller, controlling ON/OFF of the heater lamp with HLON and HLOFF signals.

Heater temperature control, high temperature error, low temperature error, thermistor open are detected and processed by the CPU.

Heater lamp control circuit

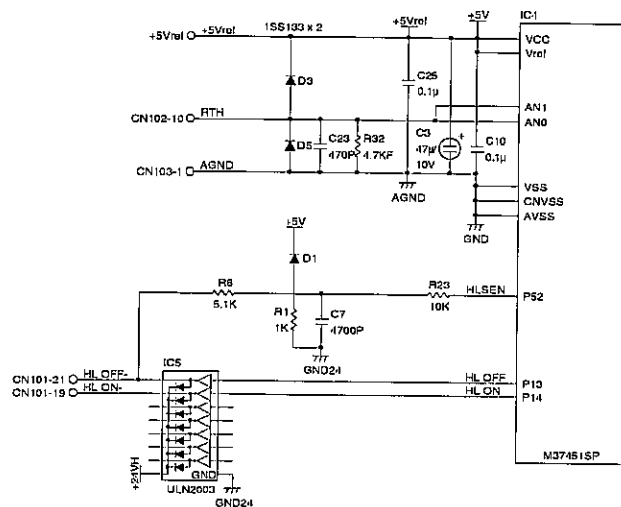


Fig. 12-13-1

Heater control signal self test

When the power is ON, heater lamp control signals HLON and HLOFF are changed. When HLSEN is not as shown below, there may be some trouble in the heater lamp control system. In that case, the heater lamp is turned off and the low temperature error (SERVICE C5) is displayed.

| HLON | HLOFF | HLSEN |
|------|-------|-------|
| L | L | L |
| L | H | L |
| H | L | L |
| H | H | H |

Tab. 12-4

Polygon motor

When the motor speed reaches the specified level (11338.583 rpm), PMTLK signal is supplied and ON/OFF of the motor is controlled by PMD.

Polygon motor control block diagram

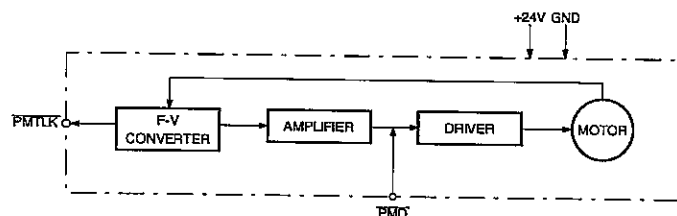


Fig. 12-3-2

2. Print control peripheral circuit

2-1. Operation panel unit (OPU)

The OPU is composed of the LCD display section (16-digit, one line), four LEDs and their driver, eight key switches and their multiplexer, and the paper exit sensor. It is controlled by the 8-bit CPU of PCU.

Major functions

- LCD display function
Controls LCD display/blinking in one line of 16 digits by the LCD driver.
- LED display function
Latches data in LS173 and lights four LEDs.
- Key input multiplex function
Multiplexes eight key inputs with LS151.
- Paper exit detection
Detects paper exit with the photo interrupter.

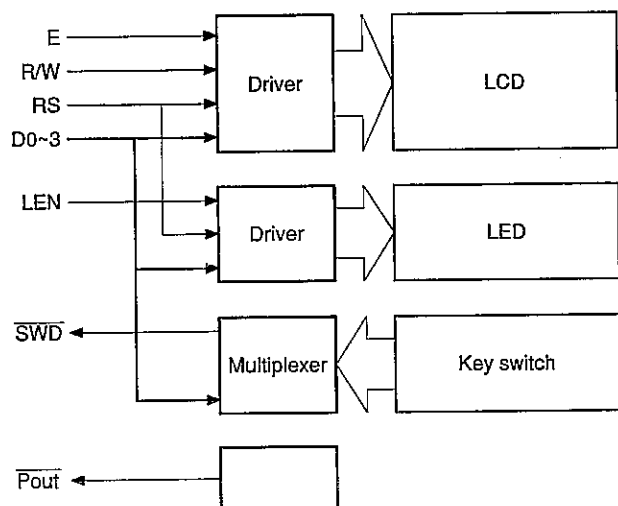


Fig. 12-14

| | |
|--------|--|
| E | LCD control data synchronous signal |
| R/W | LCD control data read/write signal, H: read |
| RS | LCD control resistor selection signal |
| D3 ~ 0 | LCD control data bus, LED data bus, key signal address |
| LEN | LED data enable signal |
| SWD | Key input signal |
| Pout | Paper exit sensor signal |

LCD control block diagram

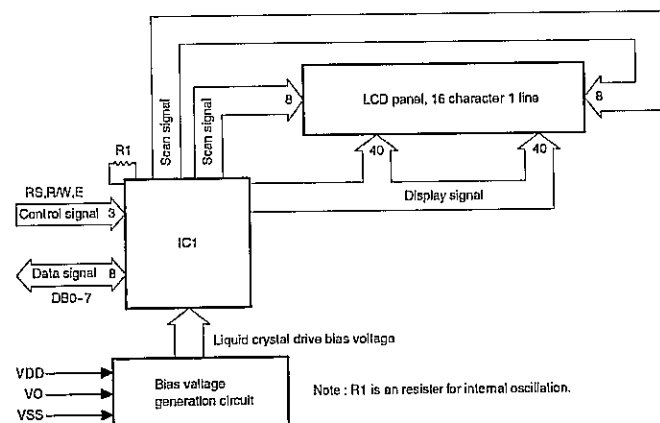


Fig. 12-15

2-2. Laser scanning unit (LSU)

The LSU is composed of the polygon motor unit, the laser driver, and the BD circuit.

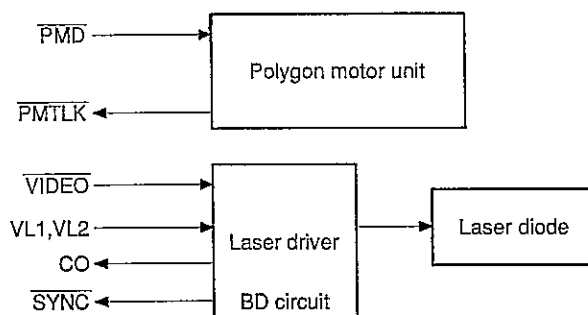


Fig. 12-16-A

VIDEO: A low on this line causes the laser diode to emit a beam.

SYNC: A Laser beam is detected at a high to low transition of this signal.

VL1: LD POWER setting rough adjustment voltage output pin from CPU in PCU.

VL2: LD POWER setting fine adjustment voltage output pin from CPU in PCU.

CO: Laser power monitor comparator output for auto power control of the laser power.

VOFF: Laser current is forcibly turned off when LOW.

PMD (polygonal motor drive):

The polygonal motor starts with a low state of this signal and stops with a high state of the signal.

PMTLK (polygonal motor lock)

PLL sync complete signal.

Low: Sync rotation

High: Async rotation

It requires 6 seconds, max., before PMTLK becomes low after PMD is set low.

The LDD PWB has the following functions

- (1) The laser diode drive circuit performs auto power control with a software in the CPU of the process control unit (PCU). The voltage outputted from the D/A converter of the CPU is applied to the two independent voltage pins of rough/fine adjustment to set the drive voltage of the laser diode. The APC feedback laser power is detected by comparing the monitor current of the monitor photo diode included in the laser diode with the reference power in the comparator inside the laser driver, and is outputted to the CPU as logic information.
- (2) Beam emit power of the laser diode is maintained at the given level constant at all times.
- (3) SYNC is issued.
The signal SYNC is issued when laser beam is detected, to determine the write start position.
- (4) Laser diode beam emit is controlled on and off with the VIDEO signal.
- (5) VOFF keeps the laser OFF when the power voltage is not stable at rising.

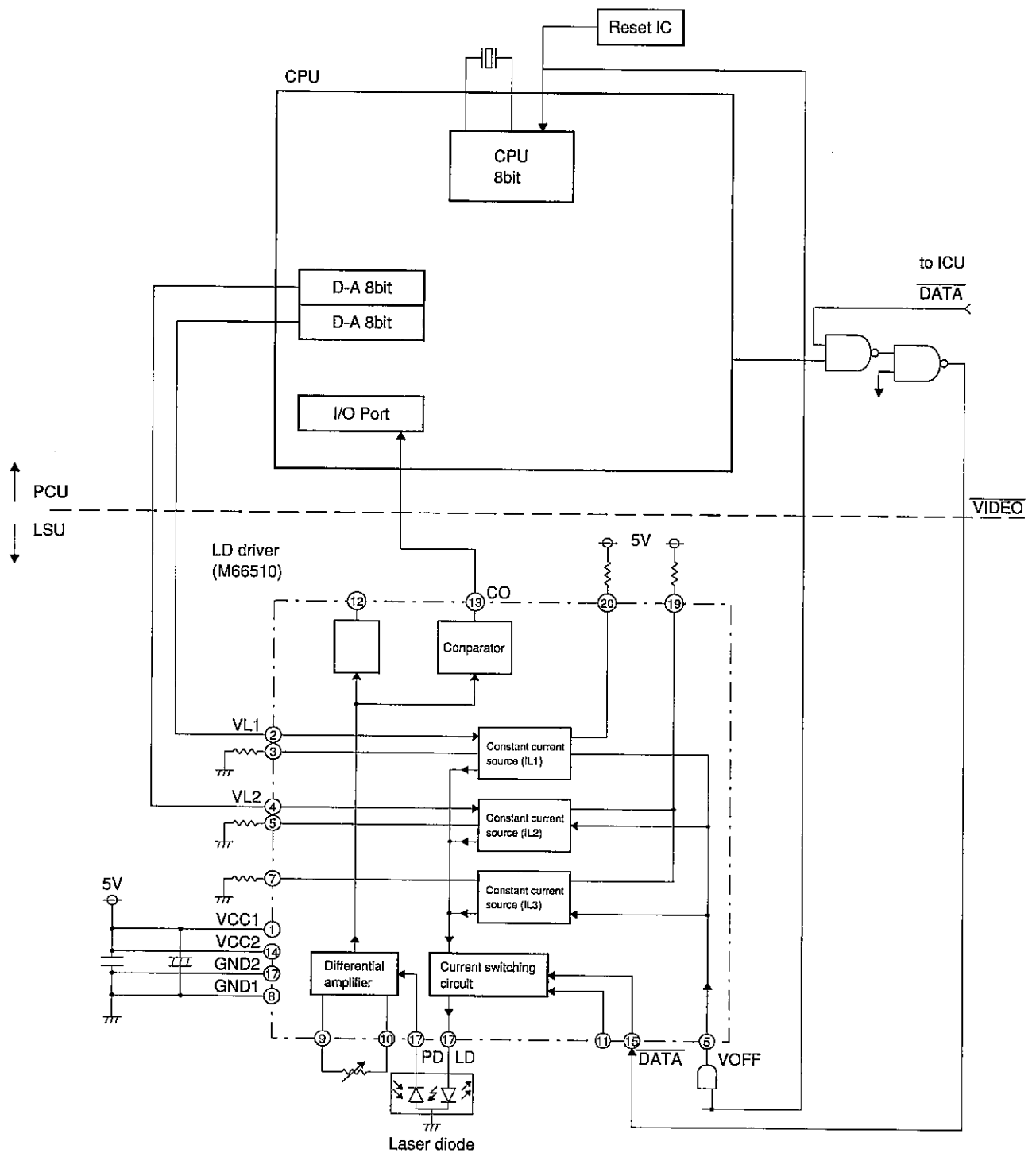


Fig. 12-16-B Laser diode drive (including APC) block diagram

3. PCU soft

3-1. PCU ↔ ICU interface

3-1-1. Video data timing

VIDEO DATA TRANSMISSION TIMING CHART

8PPM or less

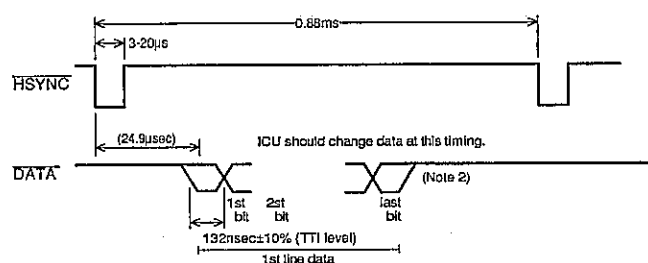


Fig. 12-17

Note: ICU need to have the following control circuit.

1. Top margin control
Circuit decided the top margin area from first HSYNC signal per page.
2. Left margin control
Circuit decided the left margin area from HSYNC signal per line.
3. Jitta control
Circuit generates HSYNC signal synchronized by the forth clock of video clock.

DATA to be H level (white) after sending the last bit of line data.
The first HSYNC signal is on the top edge of a page.
The DATA should be more than 50ns at minimum. To obtain the positioning of 600 dpi, one DATA width must be 132ns ± 10% at TTL level.

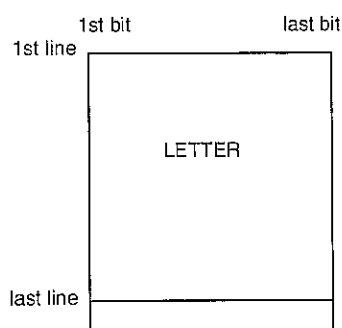


Fig. 12-18

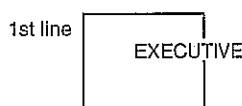


Fig. 12-19

3-1-2. Printing operation sequence

Printing Operation sequence

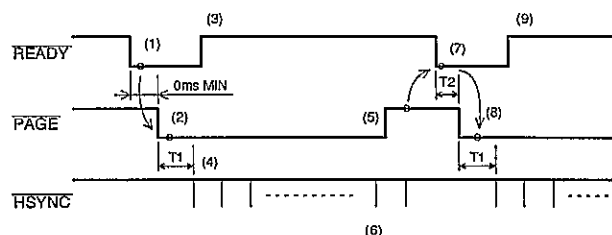


Fig. 12-20

- (1) PCU is ready for printing.
- (2) Start request from ICU to PCU.
- (3) PCU, on receiving $\overline{\text{PAGE}}$, send PGACK command to ICU, makes the mechanism start and turns $\overline{\text{READY}}$ to H (busy state).
- (4) PCU turns on the polygon motor and, after completing the preparatory process starts to send HSYNC pulses.
(The time of T1 for the first printing is changed depending on the processing condition)
- (5) ICU, after sending one page of data, turn $\overline{\text{PAGE}}$ to H. $\overline{\text{PAGE}}$ signal should remain low during the complete page printing time. PCU generates maximum 10 HSYNC pulses past $\overline{\text{PAGE}}$ goes high. The maximum number of HSYNC pulses is about 12000 lines if $\overline{\text{PAGE}}$ has been low. Then PCU waits until $\overline{\text{PAGE}}$ goes high.
- (6) On completion of last line printing, printed copy is send out.
- (7) Same as (1).
- (8) Start request from ICU to PCU.
- (9) Same as (3).

NOTE: (1) The duration of the unstable $\overline{\text{PAGE}}$ pulse, which occurs when the controller power turns ON/OFF, should be 50 ms at maximum.

In case that such duration is more than 50 ms, PCU might recognize $\overline{\text{PAGE}}$ is effective.

- (2) In order to run the printer at it's maximum speed, Printer have to feed the paper by the prefeed command.

3-1-3. Prime processing sequence

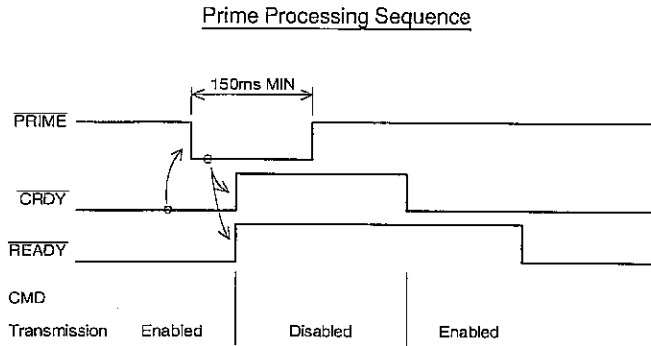


Fig. 12-21

Sequence:

- (1) ICU sends $\overline{\text{PRIM}}$ on conditions that it is not sending CMD and $\overline{\text{CRDY}}$ is Low. (The width of $\overline{\text{PRIM}}$ pulse should be 150 ms at minimum)
- (2) PCU, after receiving $\overline{\text{PRIM}}$, makes $\overline{\text{CRDY}}$ and $\overline{\text{READY}}$ High on condition that it is not sending STS.

Note: PCU is not required to send back a response (STS) to the last CMD from ICU.

- (3) PCU makes $\overline{\text{CRDY}}$ Low on completion of the circuit initialization.
- (4) PCU makes $\overline{\text{READY}}$ Low when it is ready for printing sequence.

Note:

1. PCU can receive $\overline{\text{PRIM}}$ even when PCU is receiving command status.
2. When PCU has received $\overline{\text{PRIM}}$ during the printing operation, it performs a circuit initialization after completion of the printing sequence.

3-1-5. Function of interface signals

| SIGNAL | DIRECTION | FUNCTION |
|---------------------------|---|--|
| $\overline{\text{READY}}$ | ICU \leftarrow PCU (Ready) | L for ready to print. H for warm-up, error detected or printer busy. |
| $\overline{\text{PRIM}}$ | ICU \rightarrow PCU (Prime) | Initialize request to PCU. Active L state. When the printer is busy, this request is held until one page printing is completed. |
| $\overline{\text{PAGE}}$ | ICU \rightarrow PCU (Page) | Print start request to PCU. It should be L during transmission of one page full of data. When this signal is received and provided that there is no error, PCU will start operation. |
| $\overline{\text{HSYNC}}$ | ICU \leftarrow PCU (Horizontal Sync) | Sync signal for line-by-line printing. This signal indicates start timing of each line. |
| $\overline{\text{DATA}}$ | ICU \rightarrow PCU (Data) | Print video data line. L level for black and H level for white. To be kept H after transmission of one line of data. |
| $\overline{\text{CMD}}$ | ICU \rightarrow PCU (Command) | Command sending line to PCU. ICU sends various commands to PCU through this line. |
| $\overline{\text{STS}}$ | ICU \leftarrow PCU (Status) | Status sending line from PCU. ICU receives status information from PCU through this line. |
| $\overline{\text{SRDY}}$ | ICU \rightarrow PCU (Status Ready) | L for ready to receive STS signal from the PCU. When this signal is H, STS signal is ignored. |
| $\overline{\text{CRDY}}$ | ICU \leftarrow PCU (Command Ready) | L for ready to receive CMD signal from the ICU. When this signal is H, CMD signal is ignored. |
| $\overline{\text{RES}}$ | ICU \leftarrow PCU | Hardware initialize request from PCU. Active L state. |

Table 12-5

3-1-4. Power on sequence

Power-On Sequence and Initialize Request

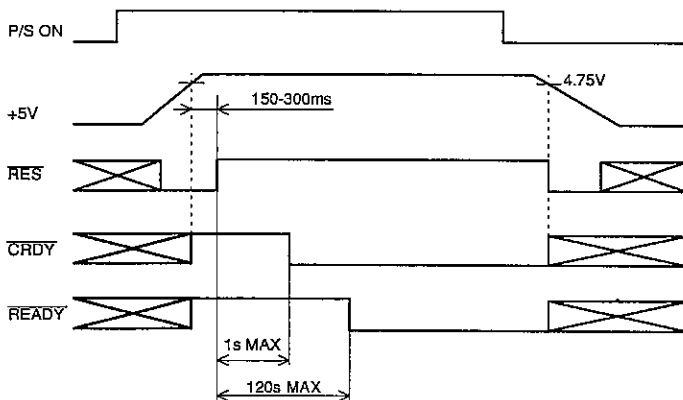


Fig. 12-22

NOTE: While the warm-up time is normally 60 seconds, it will be extended to 120 seconds at maximum for Toner density adjustment in the event of a toner near end or a toner empty.

3-2. Serial interface

3-2-1. Serial interface specification

Baud rate: 9600bps
 Character size: 8bits
 Start bit: 1bit
 Stop bit: 1bit
 Parity bit: None
 System: Full duplex, async

The PCU serial interface uses M37451 single chip CPU internal serial interface circuit and the command is processed by the interrupt routine program after the PCU has received a byte.

The ICU needs to set the two single byte code transfer interval to 1.5msec. minimum, when sending the control code and status code.

At present, the PCU performs send or receive in an interval or 3msec. Figure next shows the table of commands transferred between ICU and PCU.

Exchange timing of CMD and STS signals

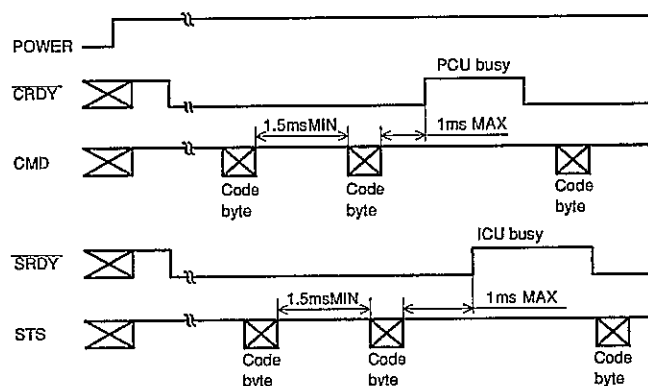


Fig. 12-23

3-2-2. Control code exchange procedure

[Control Code-Exchange Procedures]

| CONTROL CODE | | PROCEDURE | | | FUNCTION |
|--------------|-------|-----------|--------|----------------|---|
| HD* | NAME | ICU | LINE | PCU | |
| 80 | SSA | 80 | → ← | 80, STSA | Status Sense A. ICU reads status A from PCU. |
| 81 | SSB | 81 | → ← | 81, STSB | Status Sense B. ICU reads status B from PCU. |
| 82 | SSC | 82 | → ← | 82, STSC, STSD | Status Sense. ICU reads status from PCU. |
| 83 | PSRD | 83 | → ← | 83, SIZEDL | Paper Size Read Dual. ICU reads status of upper/lower paper size. |
| 84 | LEDL | 84 | → ← | 84, LEDS | LED Status Read. ICU reads status of LED lights on control panel. |
| 85 | SWR | 85 | → ← | 85, SW1S, SW2S | Switch Status Read. ICU reads status of switches on control panel. |
| 86 | PSZR | 86 | → ← | 86, SIZE | Paper Size Read. ICU reads status of paper size. |
| 8A | LFOV | 8A | → ← | 8A, LIFE | Life over. ICU reads status of life over from PCU. |
| 8F | ROMNO | 8F | → ← | 8F, ROMNO | PCU ROM Revision number. ICU reads the revision number of the PCU software. |

| CONTROL CODE | | PROCEDURE | | | FUNCTION |
|--------------|---------|--------------|------|----------------|---|
| HD* | NAME | ICU | LINE | PCU | |
| 90 | SWSCHG | | ← | 90, SW1S, SW2S | Switch Status Changed. PCU sends switch status to ICU when there is a status change of switches on control panel. |
| 92 | PPOUT | | ← | 92 | Paper printed out. PCU sends status to ICU when paper is out on the output tray. |
| 93 | PCUERR | | ← | 93 | PCU Error. This code indicates error detected in PCU. |
| 94 | PCHSTD | | ← | 94 | Paper size change of the upper tray. |
| 95 | PCH2ND | | ← | 95 | Paper size change of the lower tray. |
| 96 | PGACK | | ← | 96 | Acknowledge of page signal. |
| 97 | PFA | | ← | 97 | Acknowledge of prefeed command. |
| 98 | ERRRV | | ← | 98 | ERROR Recovery Command. |
| A1 | TRSEL | A1, TRAY | → | | Paper Tray select. PCU selects paper tray by TRAY. |
| A2 | PFC | A2 | → | | Prefeed Command |
| A3 | PMSTT | A3 | → | | Polygon Motor Start. Polygon motor is also started by PAGE signal. |
| A4 | PERST | A4 | → | | PCU Error Reset. PCU resets PCU errors that are resettable. |
| A5 | BUZZER | A5 | → | | Buzzer. Buzzer beeps for 0.3sec. |
| A6 | BZON | A6 | → | | Buzzer on. Buzzer is beeping until A7 command is send. |
| A7 | BZOFF | A7 | → | | Buzzer off |
| B0 | LEDON | B0, LEDS | → | | LED Indicator On. PCU turns on LED lights according to LEDS. |
| B1 | LEDBK | B1, LEDS | → | | Operation Panel LED Blinking Start. |
| C1 | LCDCLDP | C1, DDA, CGA | → | | LCD Character Display. Character addressed by CGA in character generator is displayed on LCD cell addressed by DDA. |

| CONTROL CODE | | PROCEDURE | | | FUNCTION |
|--------------|---------|-----------------------------------|------|-----|---|
| HD* | NAME | ICU | LINE | PCU | |
| C2 | LCDCBK | C2,DDA | → | | LCD Character Blinking start. Character on LCD cell addressed by DDA starts Blinking. |
| C3 | LCDCBOF | C3,DDA | → | | LCD Character blinking stop. Character on LCD cell addressed by DDA stops Blinking. |
| C4 | LCDDCL | C4 | → | | LCD Display Clear. All characters on LCD panel are cleared. |
| C5 | LCDDPOS | C5,DDA | → | | LCD Positioning. ICU designates the position on LCD cell addressed by DDA. |
| C6 | LCDCHR | C6,CGA1,CGA2, ... CGAn,NUL(00) | → | | LCD Character strings ICU sends the character strings to LCD panel. |
| C7 | LCDDL | C7,CGA,BD0,BD1 ... BD6 | → | | Download the LCD character data ICU sends dot data of the character. |

* - Control code in 2-digits hexadecimal number.
LINE: → for CMD line, and ← for STS line.

Table 12-6



[Status Codes, STSA to STSD]

| Bit | STSA, PCU Status | STSB, Operator Call | STSC, Hardware Error (1) | STSD, Hardware Error (2) | LIFE, Life over |
|-----|------------------------|---------------------------|--------------------------------|--------------------------------|-------------------------------------|
| D7 | 0 | 0 | 0 | 0 | 0 |
| D6 | Warm-up | Toner Empty | PCU ROM Error | Optical System Error | Photo-conductor Cartridge Life over |
| D5 | Operator Call | Paper Empty | PCU RAM Error | Main Motor Defective | 0 |
| D4 | Hardware Error | Paper Jam | NV-RAM Error | Polygon Motor Defective | 0 |
| D3 | Life over | Printer Open | Serial Communication Error | Heater High Temperature | 0 |
| D2 | Manual Feed SW ON | Photo-conductor near end | 0 | Heater Low Temperature | 0 |
| D1 | PCU Diagnostic Test | Developer near end | 0 | Thermistor open | 0 |
| D0 | Toner mixing mode | 0 | 0 | 0 | 0 |

Logic One (1) for Set, and Logic Zero (0) for Reset.

Table 12-7

[Status Codes: LEDS, and SW1S.]

| Bit | LEDS, LED Light Status | SW1S, Switch Status | SW2S, Switch Status |
|-----|---------------------------|---|------------------------|
| D7 | 0 | FORM FEED | 0 |
| D6 | ERROR | TEST PRINT | 0 |
| D5 | MANUAL | MENU | 0 |
| D4 | ONLINE | LINE | 0 |
| D3 | DATA |  | 0 |
| D2 | 0 |  | 0 |
| D1 | 0 | CONTINUE | 0 |
| D0 | 0 | ENTER | 0 |

Logic One (1) for switch ON or LED Light lit;
Logic Zero (0) for switch OFF or LED light OFF.

Table 12-8

[Status Code: SIZE, TRAY]

| BIT | SIZE PAPER SIZE STATUS | SIZEDL PAPER SIZE DOUBLE | OPTION OPTIONAL STATUS |
|-----|------------------------------|--------------------------------|------------------------------|
| D7 | INPUT TRAY PAPER CODE | UPPER TRAY PAPER CODE | 0 |
| D6 | | | MANUAL FEED |
| D5 | | | UPPER TRAY |
| D4 | | | LOWER TRAY |
| D3 | 0 | LOWER TRAY PAPER CODE | 0 |
| D2 | 0 | | 0 |
| D1 | 0 | | 0 |
| D0 | 0 | | 0 |

Table 12-9

| PAPER CODE | | | | SIZE |
|------------|----|----|----|----------|
| D7 | D6 | D5 | D4 | |
| 0 | 0 | 0 | 0 | NO TRAY |
| 0 | 0 | 0 | 1 | LEGAL |
| 0 | 0 | 1 | 0 | LETTER |
| 0 | 0 | 1 | 1 | — |
| 0 | 1 | 0 | 0 | ENVELOPE |
| 0 | 1 | 0 | 1 | A4 |
| 0 | 1 | 1 | 0 | — |
| 0 | 1 | 1 | 1 | — |

Table 12-10

[Status Code, DDA]

| Cell No. | DDA* | Cell No. | DDA* |
|----------|------|----------|------|
| 1 | 00 | 9 | 08 |
| 2 | 01 | 10 | 09 |
| 3 | 02 | 11 | 0A |
| 4 | 03 | 12 | 0B |
| 5 | 04 | 13 | 0C |
| 6 | 05 | 14 | 0D |
| 7 | 06 | 15 | 0E |
| 8 | 07 | 16 | 0F |

*: Status Code in 2-digits hexadecimal number.

Table 12-11

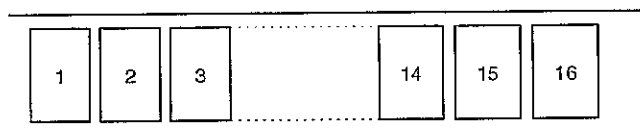


Fig. 12-24

Status Code, CGA and Display Character.

| Upper 4bit | Lower 4bit | 0000 | 0010 | 0011 | 0100 | 0101 | 0110 | 0111 | 1010 | 1011 | 1100 | 1101 | 1110 | 1111 |
|------------|------------|------|------|------|------|------|------|------|------|------|------|------|------|------|
| XXXX0000 | CG RAM (1) | | | 00P | 0P | 0P | 0P | 0P | 0P | 0P | 0P | 0P | 0P | * |
| XXXX0001 | (2) | | | 11P | 1P | 1P | 1P | 1P | 1P | 1P | 1P | 1P | 1P | * |
| XXXX0010 | (3) | | | 22P | 2P | 2P | 2P | 2P | 2P | 2P | 2P | 2P | 2P | * |
| XXXX0011 | (4) | | | 33P | 3P | 3P | 3P | 3P | 3P | 3P | 3P | 3P | 3P | * |
| XXXX0100 | (5) | | | 44P | 4P | 4P | 4P | 4P | 4P | 4P | 4P | 4P | 4P | * |
| XXXX0101 | (6) | | | 55P | 5P | 5P | 5P | 5P | 5P | 5P | 5P | 5P | 5P | * |
| XXXX0110 | (7) | | | 66P | 6P | 6P | 6P | 6P | 6P | 6P | 6P | 6P | 6P | * |
| XXXX0111 | (8) | | | 77P | 7P | 7P | 7P | 7P | 7P | 7P | 7P | 7P | 7P | * |
| XXXX1000 | (1) | | | 88P | 8P | 8P | 8P | 8P | 8P | 8P | 8P | 8P | 8P | * |
| XXXX1001 | (2) | | | 99P | 9P | 9P | 9P | 9P | 9P | 9P | 9P | 9P | 9P | * |
| XXXX1010 | (3) | | | AAP | AP | AP | AP | AP | AP | AP | AP | AP | AP | * |
| XXXX1011 | (4) | | | BBP | BP | BP | BP | BP | BP | BP | BP | BP | BP | * |
| XXXX1100 | (5) | | | CCP | CP | CP | CP | CP | CP | CP | CP | CP | CP | * |
| XXXX1101 | (6) | | | DDP | DP | DP | DP | DP | DP | DP | DP | DP | DP | * |
| XXXX1110 | (7) | | | EEP | EP | EP | EP | EP | EP | EP | EP | EP | EP | * |
| XXXX1111 | (8) | | | FFP | FP | FP | FP | FP | FP | FP | FP | FP | FP | * |

*1: High-order *2: Low-order *: Prohibition of Input

Table 12-12

3-3. Timing chart

3-3-1. Preliminary rotation timing (Warming-up)

Before starting the image forming process, preliminary rotation cycle is performed to initialize the OPC drum state. Process control differs from the previous process completion state (normal completion or abnormal completion).

There are two types of abnormal completion.

- (1) During the main motor rotation, an error other than toner empty, life over, and paper empty occurs.
- (2) The power is cut off during the main motor rotation.

The preliminary rotation cycle is performed in the following two cases:

- (1) When the power is supplied. (Except for diag mode)
- (2) When an error state is reset. (A4 error reset command is outputted from ICU.)

Timing chart of normal completion and abnormal completion is shown below:

3-3-1-1. Preliminary rotation timing chart after normal completion

[Manual mode]

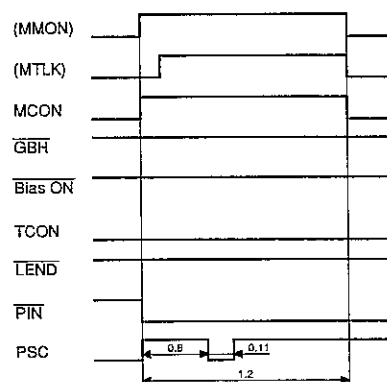


Fig. 12-26

[Reserve mode]

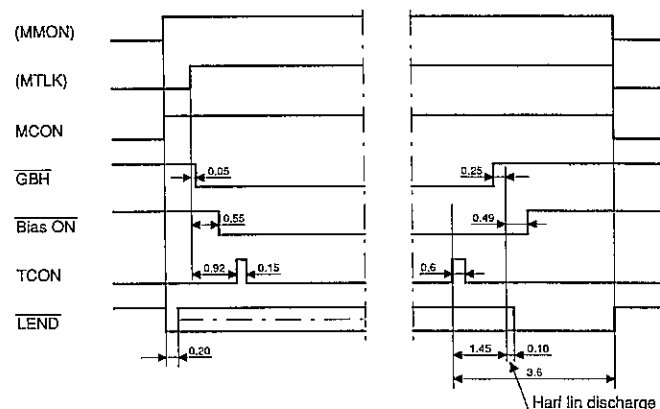


Fig. 12-27

3-3-1-2. Preliminary rotation timing chart after abnormal completion

[Abnormal completion]

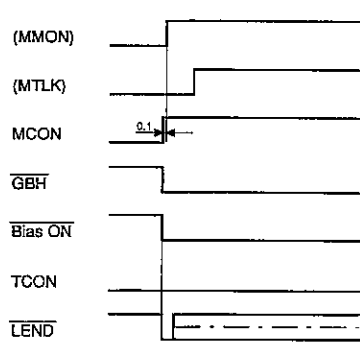


Fig. 12-28

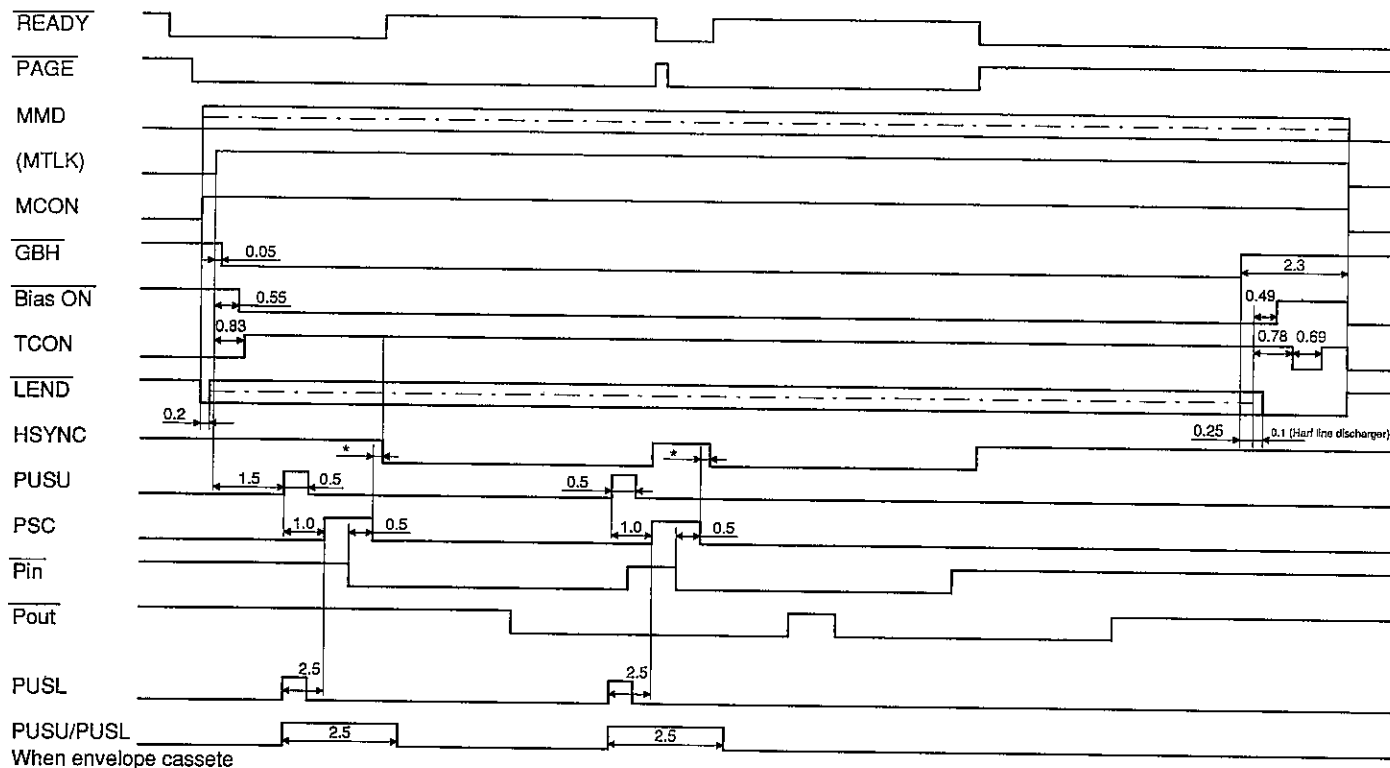
3-3-2. Print cycle timing

When the printer engine satisfies the following conditions, if PAGE signal is issued by the ICU, the printer engine starts print cycle.

- (1) Preliminary rotation is completed.
- (2) Warming-up is completed. (Warming-up is completed when the heater roller temperature reaches 160 degree C after preliminary rotation start.)
- (3) There is no error.

3-3-2-1. Print cycle timing chart

[Print cycle timing]



*96 line

Fig. 12-29

3-4. Error detection specifications

The criteria of error of the printer engine (except for ICU) are as follows:

(1) Paper jam

1. The paper exit sensor is not turned on within 4.5 sec after turning off PSC (paper stop clutch).
2. The paper exit sensor is not turned on within 4.8 sec after turning off the paper in sensor.
3. The paper in sensor is not turned off within 8.8 sec after turning off the paper in sensor.
4. The paper in sensor is not turned on within 5.1 sec after turning on PUSU (upper cassette paper pick up solenoid).
5. The paper in sensor is not turned on within 6 sec after turning on PUSL (lower cassette paper pick up solenoid).
6. The paper exit sensor is turned on except during the print cycle.

(2) Paper out

1. No paper in the selected cassette.
2. No cassette installed.

(3) Cover open

1. When the safety switch is off.

(4) Drum cartridge life over

* Refer to [2]-4

(5) DV cartridge life over

* Refer to [2]-4

(6) SERVICE P1 (PCU ROM) error

1. ROM check error occurs after turning on the power.

(7) SERVICE P2 (P/CU ROM) error

1. PCU RAM read/write check error occurs after turning on the power.

(8) SERVICE P3 (NVRAM error)

1. NVRAM check error occurs after turning on the power.

(9) SERVICE P4 (Serial transmission error)

1. An over run error or framing error occurs when CMD from ICU is received by PCU.

(10) SERVICE C1 (Optical system error)

1. Abnormality in APC.
2. SYNC is not detected.

(11) SERVICE C2 (Main motor error)

1. When the main motor is stopped or out of order for 3 sec or more.
(The main motor rotation is detected by the toner sensor ripple.)

(12) SERVICE C3 (Polygon motor error)

1. PMTLK does not become LOW within 15 sec after turning PMD to LOW.

(13) SERVICE C4 (Heater high temperature error)

1. Fuser temperature exceeds 240 degrees C.

(14) SERVICE C5 (Heater low temperature error)

1. Thermistor temperature falls under 85 degrees C or warm-up operation is not completed in 2 minutes.
2. Abnormality in heater control signal (HLON, HLOFF).

(15) SERVICE C6 (Thermistor open)

1. RTH = 0V is detected.

4. Power unit

In the power unit, the AC input is directly rectified and smoothed, and the voltage is transformed by the transformer in the switching system. Then it is rectified and smoothed again to obtain DC voltages (+24V, +5V). This power unit transforms +24V outputted from the power unit in the switching (chopper) system to provide +5V DC voltage.

Fig. 1 shows the block diagram, and circuit descriptions are given in the following.

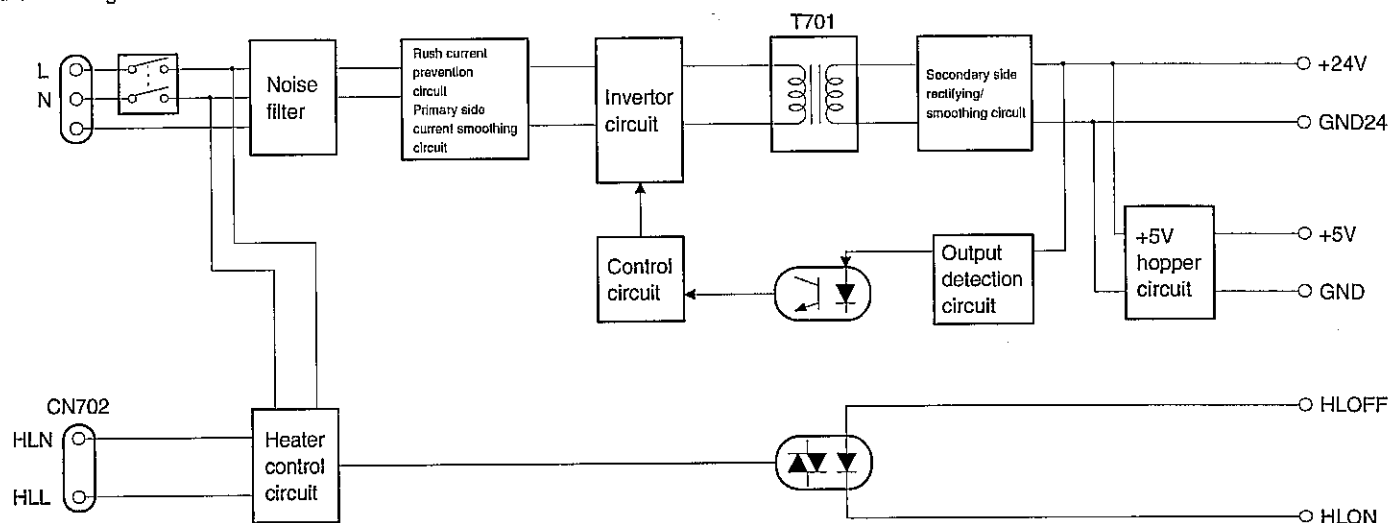


Fig. 12-30

4-1. Noise filter circuit

This circuit reduces normal mode noise and common mode noise from the AC line. The normal mode noise is the noise overlapped in the AC line or the output line, and is attenuated by L701, L702, C701 and C702.

The common mode noise is the noise generated between the AC line and GND, and is passed to GND through C705 and C706.

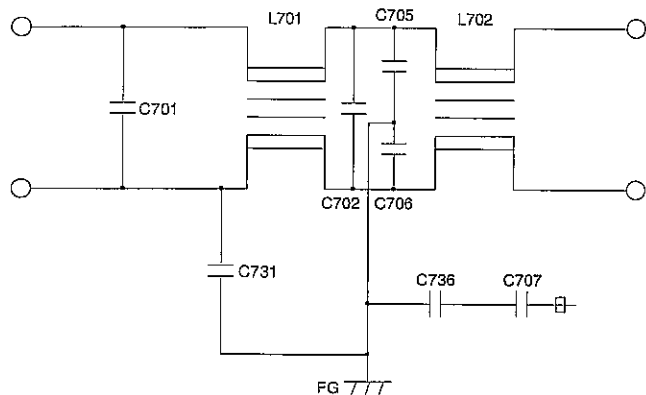


Fig. 12-31

4-2. Rush current prevention circuit

Since AC input is directly rectified and smoothed, a great rush current may be generated by the charging current flowing through the capacitor and the switch contacts may be damaged. To prevent this, power thermistor TH701 is provided between rectifier BD701 and capacitor C709 to suppress a rush current. TH701 has a characteristic which reduces resistance when temperature rises. Its normal resistance value is nearly 0 ohm.

4-3. Primary side rectifying/smoothing circuit

This is a full wave rectifying circuit which converts AC voltage of 50/60Hz into a DC voltage. The solid line and the dotted line shows the charging path of C709.

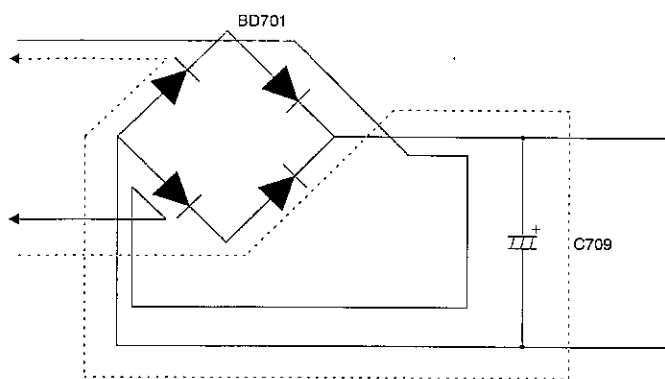


Fig. 12-32

4-4. Inverter circuit

In the flyback converter system, FET connected in series to the converter transformer performs ON/OFF operation. Energy accumulated in the transformer during ON period is discharged to the secondary side during OFF period. The DC voltage from the rectifying/smoothing circuit is converted into switching pulse by switching operation of Q701 controlled by the signal from the control circuit. Thus a high frequency power is supplied to the secondary side by T701.

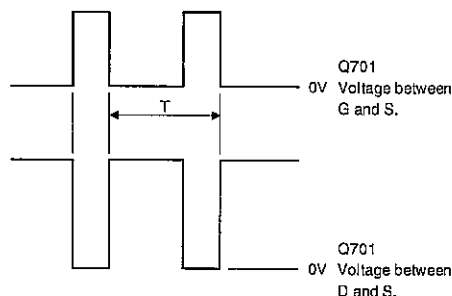
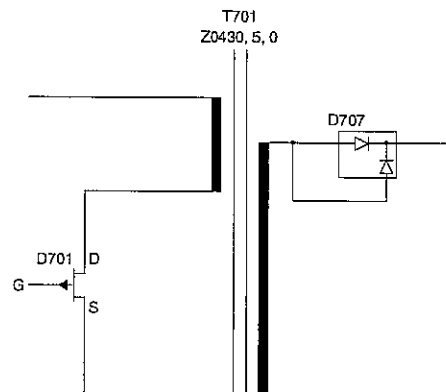


Fig. 12-33

4-5. Secondary side rectifying/smoothing circuit

The voltage of high frequency pulse generated in the inverter circuit is dropped by converter transformer T701, rectified by the high frequency diode, and smoothed by C720 and C721.

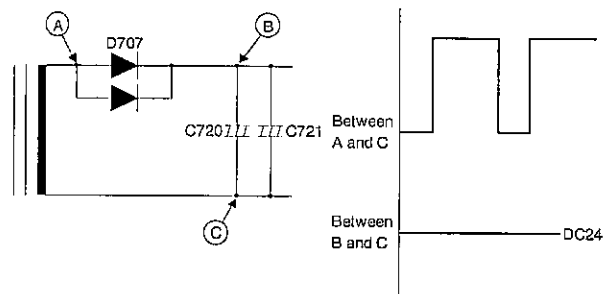


Fig. 12-34

4-6. Control circuit

This circuit operates in the PWM (pulse width modulation) control system by controlling the primary side using a power MOSFET as the switching element. The secondary side output voltage, therefore, is detected by the output detecting circuit, and the detection signal is passed through photocoupler PC701 to control IC (IC703) to stabilize the output voltage.

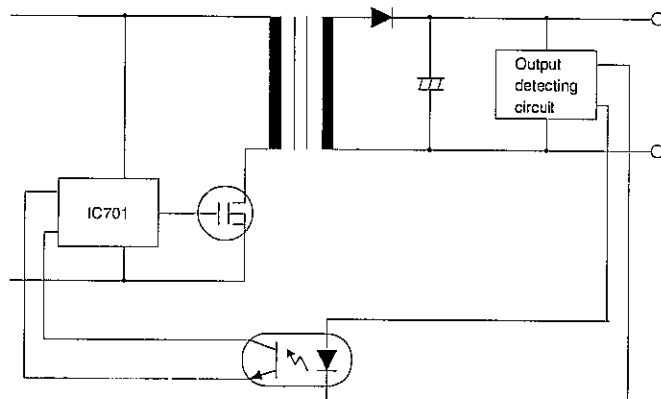


Fig. 12-35

4-7. Overcurrent protection circuit

Resistor R704 is connected to \ominus line of the primary side. When an overcurrent is generated, it is detected and the signal is sent to the control IC (IC703) to reduce the output in the secondary side.

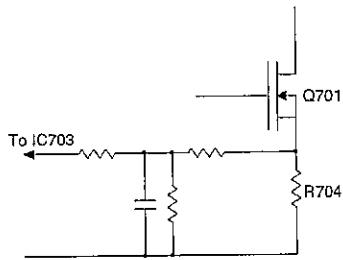


Fig. 12-36

4-8. Output detecting circuit

The 24V system output voltage is detected by R721, VR701, and R722. The detected output voltage is compared with the reference voltage in the IC701. That is, a change in the output voltage is transmitted the control IC (IC701) in the primary side by changing the cathode current of IC701 and the resultant PC701 light emitting section current. The output voltage is controlled in this manner.

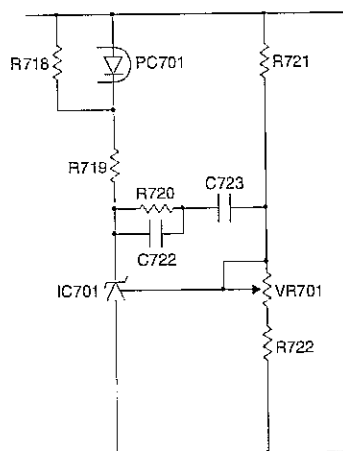


Fig. 12-37

4-9. Overvoltage detecting circuit

The 24V system detects overvoltage with ZD707, and the 5V system with ZD708. Then SCR701 is turned on to stop the output.

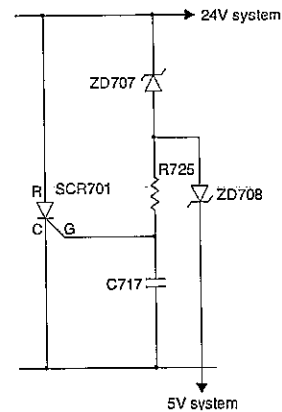


Fig. 12-39

4-10. Chopper circuit (5V output)

The chopper circuit is shown in Fig. 10. The solid line shows the current when Q705 is turned on. The dotted line shows the current generated by counter-electromotive force produced in L704 when the circuit is turned off.

When Q705 is turned on/off in the waveform shown in Fig. 4 in the switching frequency determined by IC702, the supplied rectangular waveform voltage is integrated and smoothed by L705, C727, and C728 to convert 24V into 5V. The detection signal from the voltage detecting circuit (R741, VR702, R743) is sent to IC702 to control on/off period of Q704 to stabilize the output.

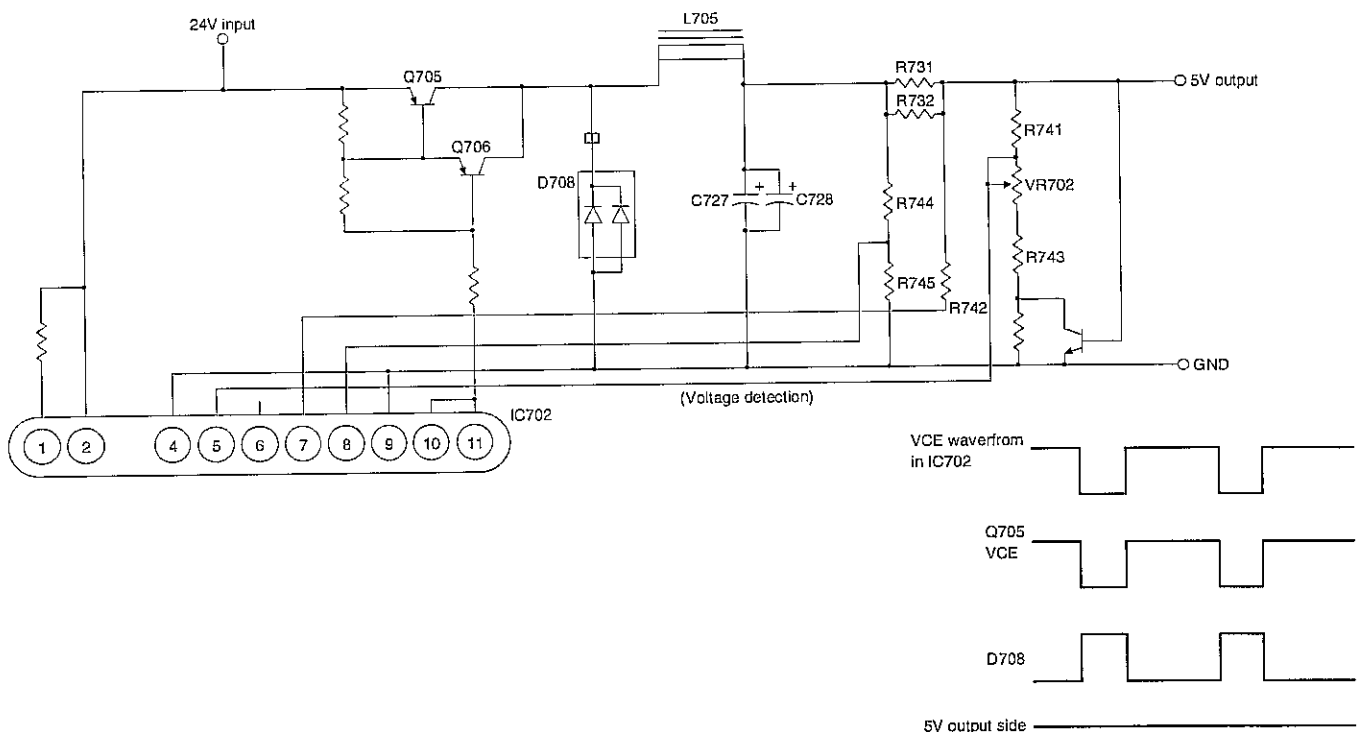


Fig. 12-39

[13] Interface controller unit (ICU)

1. General

This controller uses an AM29005 as the CPU to provide operating frequency of 9.83MHz, allowing access to the instruction ROM without wait.

The peripheral circuit which operates the CPU is composed of interface LSI of gate array chip. The LSI includes the address decoder, the I/F circuits, the DRAM controller, the ROM control, and the FIFO control.

The standard equipment includes the Centronics I/F which connects with the host, and the VIDEO I/F which connects the PCU. The RS232C I/F and the Apple talk I/F are optionally available to allow connection with the host. The other optional equipment includes the 2-slot font card, the 2-slot expansion memory, and the PS board. In addition, this controller is equipped with the HRT function which increases resolution of 300DPI data to 600DPI. This function is performed with the gate array and FIFO.

2. Hardware composition

2.1. Block diagram

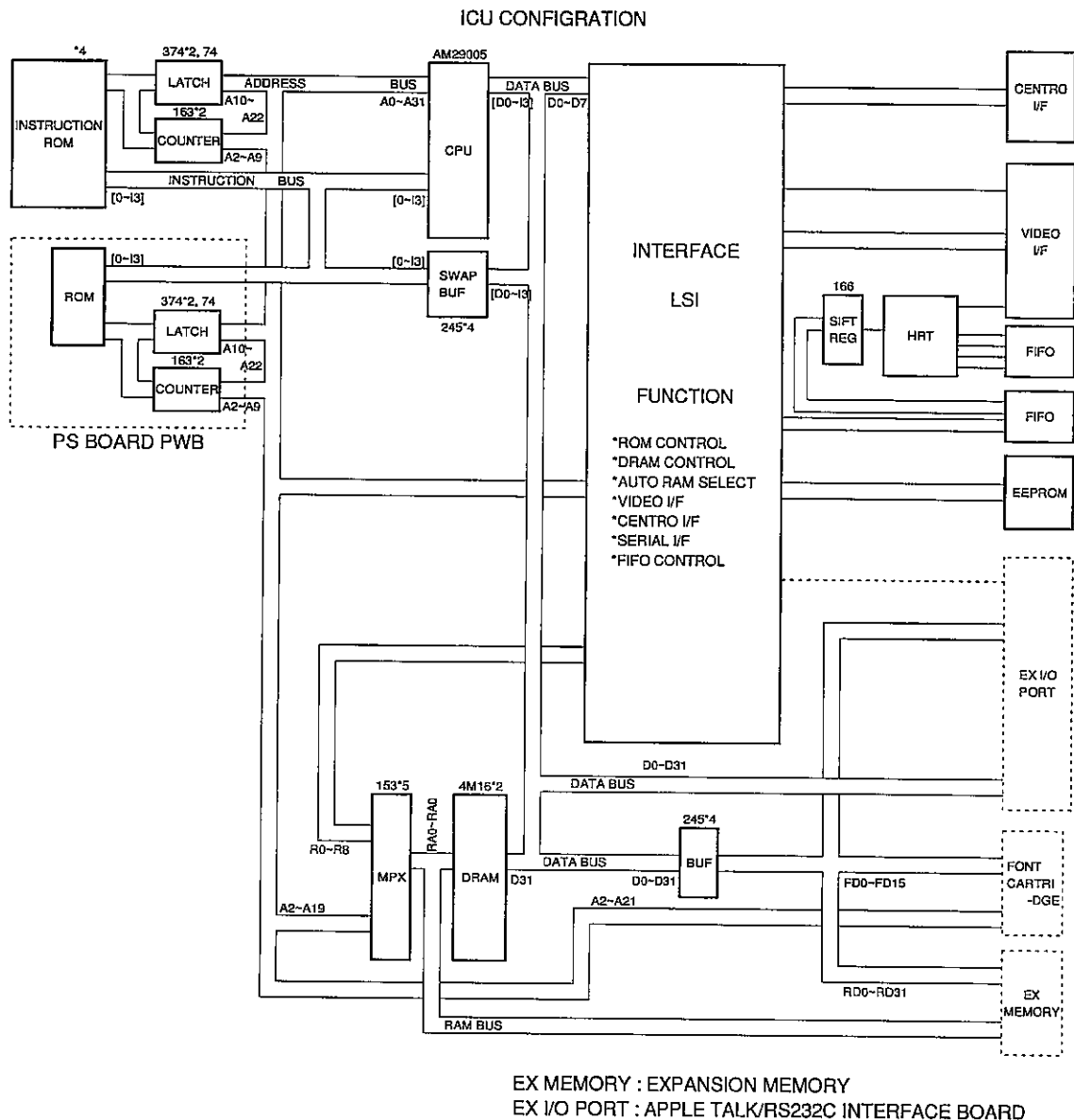


Fig. 13-1

2.2. Internal composition

(1) CPU

AM29005

(2) ROM composition

4M ROM (x16) 4 pcs. Total Max. 2MB

Including the program, the resident fonts, and the outline data.

(3) RAM composition

4M DRAM (x16) 2 pcs. Total Max. 1MB

(4) EEPROM

4Kbit (256 × 8) serial interface system

Stores job size, paper size, font data, and I/F setting.

(5) FIFO (x2)

5K × 8bit

1. Data from the page memory are written and read in synchronization with VIDEO CLK of PCU.

2. Eight lines are stored for the HRT function. Access is controlled by the gate array.

(6) Interface LSI

- (1) CPU peripheral circuit
- (2) ROM access circuit
- (3) DRAM controller
- (4) Automatic RAM assignment circuit
- (5) FIFO control circuit
- (6) I/F circuit
 - Centronics I/F
 - VIDEO I/F
 - RS232C I/F
- (7) Versatile I/O port
- (8) Jitter circuit
- (9) Left margin adjustment circuit

(7) HRT gate array

(8) Current consumption

5V/2A

(9) Reference dimension

295 × 152 mm

(10) Option

- (1) Font card
- (2) Expansion memory
- (3) PS board
- (4) Expansion board
 - RS232C board
 - RS232C, Apple talk board

3. Memory map

3.1. Memory map

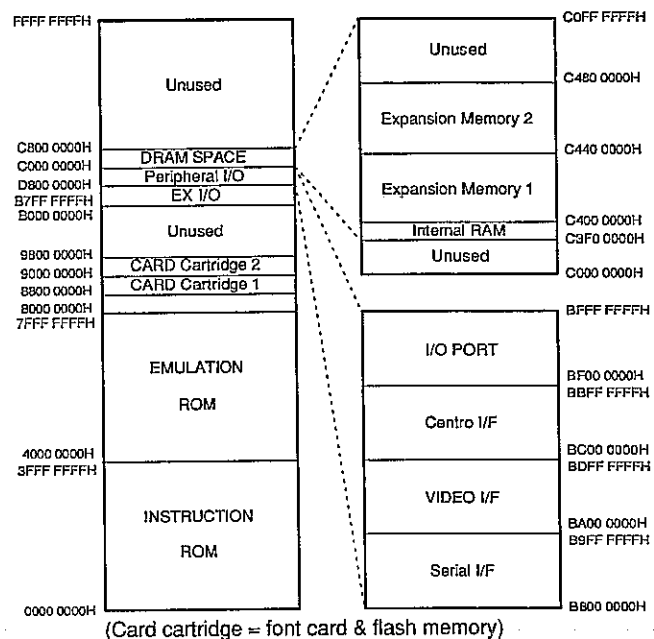


Fig. 13-2

3-2. Port table

| Port name | Address | Bit | Signal name | Function |
|------------------------|------------------|-----|-------------|--|
| Left margin | OUT BE000008H | D7 | LM7 | Left margin set value 1 count = 4 dot (300DPI) |
| | | D6 | LM6 | |
| | | D5 | LM5 | |
| | | D4 | LM4 | |
| | | D3 | LM3 | |
| | | D2 | LM2 | |
| | | D1 | LM1 | |
| | | D0 | LM0 | |
| Effective print area 1 | OUT BE00000CH | D7 | LA7 | Effective print area Low data set value 1 count = 1 dot (300 DPI) Fixed to "00H" (2560 dot) |
| | | D6 | LA6 | |
| | | D5 | LA5 | |
| | | D4 | LA4 | |
| | | D3 | LA3 | |
| | | D2 | LA2 | |
| | | D1 | LA1 | |
| | | D0 | LA0 | |
| Effective print area 2 | OUT BE000010H | D7 | UA7 | Effective print area Upper data set value 1 count = 1 dot (300 dPI) Fixed to "0AH" (2560 dot) |
| | | D6 | UA6 | |
| | | D5 | UA5 | |
| | | D4 | UA4 | |
| | | D3 | UA3 | |
| | | D2 | UA2 | |
| | | D1 | UA1 | |
| | | D0 | UA0 | |
| FIFO DATA | OUT BE000014H | D7 | VD7 | FIFO output signal |
| | | D6 | VD6 | |
| | | D5 | VD5 | |
| | | D4 | VD4 | |
| | | D3 | VD3 | |
| | | D2 | VD2 | |
| | | D1 | VD1 | |
| | | D0 | VD0 | |
| Select port | OUT BE000018H | D7 | | Reserved. |
| | | D6 | | |
| | | D5 | | |
| | | D4 | | |
| | | D3 | DPISEL | Fixed to "0." |
| | | D2 | | Reserved. |
| | | D1 | | |
| | | D0 | CLKSEL | Fixed to "0." |

| SCANO1 | SCANO2 | SCANI1 | SCANI2 | Function |
|--------|--------|--------|--------|------------------------------|
| 0 | 0 | 0 | 0 | Both of PS and EXIO are ON. |
| 0 | 0 | 1 | 0 | Only EXIO is ON. |
| 0 | 0 | 0 | 1 | Only PS is ON. |
| 0 | 0 | 1 | 1 | Both of PS and EXIO are OFF. |
| 0 | 1 | 0 | 0 | Reserved. |
| 0 | 1 | 1 | 0 | Reserved. |
| 0 | 1 | 0 | 1 | Reserved. |
| 0 | 1 | 1 | 1 | Reserved. |
| 1 | 0 | 0 | 0 | RS, APPLE TALK board |
| 1 | 0 | 1 | 0 | RS232C board |
| 1 | 0 | 0 | 1 | Reserved. |
| 1 | 0 | 1 | 1 | Reserved. |
| 1 | 1 | 0 | 0 | Reserved. |
| 1 | 1 | 1 | 0 | Input prim ON |
| 1 | 1 | 0 | 1 | Reserved. |
| 1 | 1 | 1 | 1 | Reserved. |

| Port name | Address | Bit | Signal name | Function | | |
|------------------|------------------|-----------------|-----------------|--|------------------------------|---------------|
| Versatile port | OUT BE000000H | D0 | EXIN2 | 000: Reserved. 001: 1MB 010: 2MB 011: Reserved. 100: 4MB 101: Reserved. 110: Reserved. 111: Reserved. | Front EXM capacity | |
| | | D1 | EXIN1 | | | |
| | | D2 | EXIN0 | | | |
| | | | | | | |
| | | D3 | HRT | HRT control ON signal | | |
| | | D4 | SRDY | VIDEO I/F SRDY output signal | | |
| | | D5 | | | | |
| | | D6 | SCANO1 | Input port scan enable signal | | |
| | | D7 | SCANO2 | Input port scan enable signal | | |
| | | IN BE000000H | D7 | | Fixed to "0." | |
| | D6 | | | | | |
| | D5 | | DATA IN | E ² PROM input data | | |
| | D4 | | CRDY | VIDEO I/F CRDY input signal | | |
| | D3 | | SCANI1 | Input port scan input signal | | |
| | D2 | | SCANI2 | Input port scan input signal | | |
| | D1 | | FCON1 | Font card 1 ON signal | | |
| | D0 | | FCON2 | Font card 2 ON signal | | |
| | OUT BE000004H | D7 | SINTRCLR | SYNC interrupt CLR | | |
| | | D6 | | | | |
| | | D5 | BSLCT2 | 000: 19200BAUD 001: 9600BAUD 010: 4800BAUD 011: 2400BAUD 100: 1200BAUD 101: 600BAUD 110: 300BAUD 111: Reserved. | Serial I/F baud rate setting | |
| | | D4 | BSLCT1 | | | |
| | | D3 | BSLCT0 | | | |
| | | | | | | |
| | | D2 | DATA OUT | E ² PROM data output signal | | |
| | | D1 | EECS | E ² PROM CS signal | | |
| | | D0 | EECLK | E ² PROM CLK signal | | |
| | | Centronics I/F | IN BC000000H | D7 | | Fixed to "0." |
| | D6 | | | | | |
| | D5 | | | | | |
| | D4 | | | | | |
| | D3 | | | | | |
| | D2 | | | | | |
| | D1 | | | SLCT IN | SLCT IN input signal | |
| | D0 | | | AUTO FEED | Auto feed input signal | |
| OUT BC000000H | D7 | | | Reserved. | | |
| | D6 | | BUSY ON | BUSY ON signal | | |
| | D5 | | INPCLR | Input prim_ interrupt clear signal | | |
| | D4 | | FAULT | Alarm | | |
| | D3 | | SLCT | Online/Offline | | |
| | D2 | | PE | Paper error | | |
| | D1 | | ACK | Acknowledge signal | | |
| | D0 | | BUSY CLR | BUSY signal CLR | | |
| IN BC000004H | D7 | | DT8 | Centronics input signal | | |
| | D6 | | DT7 | | | |
| | D5 | | DT6 | | | |
| | D4 | | DT5 | | | |
| | D3 | | DT4 | | | |
| | D2 | | DT3 | | | |
| | D1 | | DT2 | | | |
| | D0 | | DT1 | | | |

| Port name | Address | Bit | Signal name | Function |
|-----------|--------------------------|-----|-------------|--|
| VIDEO I/F | OUT BA000000H | D7 | CMD8 | Transmission data (CMD) |
| | | D6 | CMD7 | |
| | | D5 | CMD6 | |
| | | D4 | CMD5 | |
| | | D3 | CMD4 | |
| | | D2 | CMD3 | |
| | | D1 | CMD2 | |
| | | D0 | CMD1 | |
| | IN BA000000H | D7 | STS8 | Reception data (STS) |
| | | D6 | STS7 | |
| | | D5 | STS6 | |
| | | D4 | STS5 | |
| | | D3 | STS4 | |
| | | D2 | STS3 | |
| | | D1 | STS2 | |
| | | D0 | STS1 | |
| | OUT mode BA000004H | D7 | S2 | Stop bit 01: 1 bit Fixed. |
| | | D6 | S1 | |
| | | D5 | EP | Parity 1: EVEN 0: ODD |
| | | D4 | Parity EN | No parity Fixed to "0." |
| | | D3 | L1 | Character length 11:8 bit Fixed |
| | | D2 | L2 | |
| | | D1 | B1 | Baud rate division ratio 11: (Fixed to 1/64.) |
| | | D0 | B0 | |
| | OUT command BA000004H | D7 | EH | Reserved. |
| | | D6 | IR | Internal reset |
| | | D5 | RTS | PRIM signal |
| | | D4 | ER | Error reset |
| | | D3 | SBRK | SEND BRAKE Fixed to "0." |
| | | D2 | RxE | Reception enable |
| | | D1 | DTR | PAGE signal |
| | | D0 | TxEN | Transmission enable |
| | IN status BA000004H | D7 | DSR | READY signal |
| | | D6 | SYNDET/BD | Reserved. |
| | | D5 | FE | Framing error |
| | | D4 | OE | Overrun error |
| | | D3 | PE | Parity error |
| | | D2 | TxE | Transmission buffer empty |
| | | D1 | RXRDY | Reception allowed (Reception interruption) |
| | | D0 | TxRDY | Transmission allowed |
| RS232C | OUT B8000000H | D7 | SD8 | Transmission data |
| | | D6 | SD7 | |
| | | D5 | SD6 | |
| | | D4 | SD5 | |
| | | D3 | SD4 | |
| | | D2 | SD3 | |
| | | D1 | SD2 | |
| | | D0 | SD1 | |

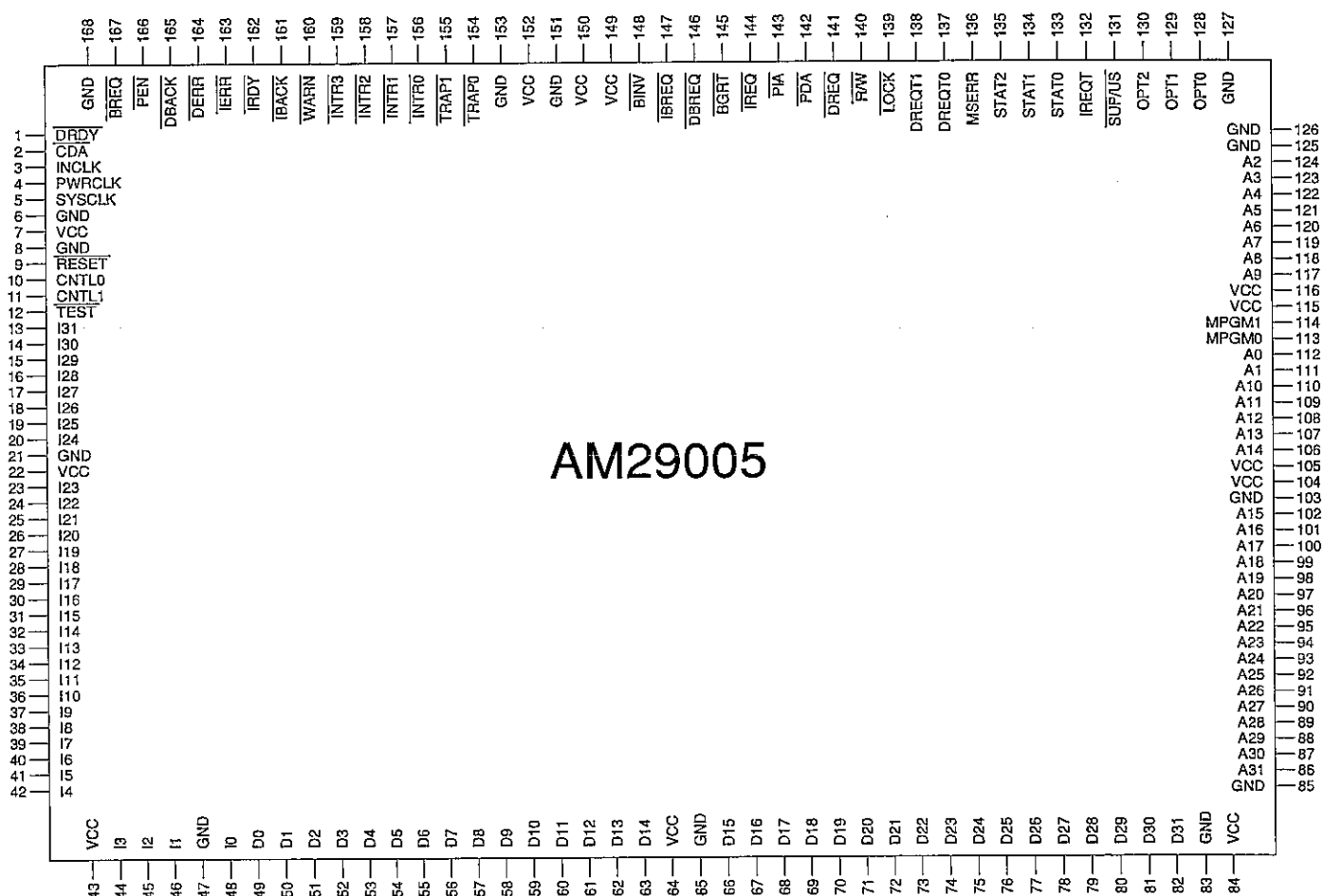
| Port name | Address | Bit | Signal name | Function |
|------------|--------------------------|-----|-------------|--|
| RS232C | IN B8000000H | D7 | RD8 | Reception data |
| | | D6 | RD7 | |
| | | D5 | RD6 | |
| | | D4 | RD5 | |
| | | D3 | RD4 | |
| | | D2 | RD3 | |
| | | D1 | RD2 | |
| | | D0 | RD1 | |
| | OUT mode B8000004H | D7 | S2 | Stop bit 00: Reserved. 01: 1 bit 10: Reserved. 11: 2 bit |
| | | D6 | S1 | |
| | | | | |
| | | D5 | EP | Parity 1: EVEN 0: ODD |
| | | D4 | Parity | Parity effective flag |
| | | D3 | L1 | Character length 00: Reserved. 01: Reserved. 10: 7 bit 11: 8 bit |
| | | D2 | L2 | |
| | | | | |
| | | D1 | B1 | Baud rate division rate 10 (Fixed to 1/16.) |
| | | D0 | B0 | |
| | OUT command B8000004H | D7 | EH | Reserved. |
| | | D6 | IR | Internal reset |
| | | D5 | RTS | Request to send |
| | | D4 | ER | Error reset |
| | | D3 | SBRK | SEND BREAK Fixed to "0." |
| | | D2 | RxE | Reception enable |
| | | D1 | DTR | Data terminal ready signal |
| | | D0 | TxEN | Transmission enable |
| | IN status B8000004H | D7 | DSR | Data set ready signal |
| | | D6 | SYNDET/BD | Reserved. |
| | | D5 | FE | Framing error |
| | | D4 | OE | Overrun error |
| | | D3 | PE | Parity error |
| | | D2 | TxE | Transmission buffer empty |
| | | D1 | RXRDY | Reception allowed (Reception interruption) |
| | | D0 | TxRDY | Transmission allowed (Transmission interruption) |
| APPLE TALK | B port OUT B0000008H | D7 | BD7 | Reserved. |
| | | D6 | BD6 | |
| | | D5 | BD5 | |
| | | D4 | BD4 | |
| | | D3 | BD3 | |
| | | D2 | BD2 | |
| | | D1 | BD1 | |
| | | D0 | BD0 | |
| | B port IN B0000008H | D7 | BD7 | Reserved. |
| | | D6 | BD6 | |
| | | D5 | BD5 | |
| | | D4 | BD4 | |
| | | D3 | BD3 | |
| | | D2 | BD2 | |
| | | D1 | BD1 | |
| | | D0 | BD0 | |

| Port name | Address | Bit | Signal name | Function |
|------------|-------------------------|-----|-------------|---------------|
| APPLE TALK | A port OUT B000000CH | D7 | AD7 | WRITE data |
| | | D6 | AD6 | |
| | | D5 | AD5 | |
| | | D4 | AD4 | |
| | | D3 | AD3 | |
| | | D2 | AD2 | |
| | | D1 | AD1 | |
| | | D0 | AD0 | |
| | A port IN B000000CH | D7 | AD7 | READ data |
| | | D6 | AD6 | |
| | | D5 | AD5 | |
| | | D4 | AD4 | |
| | | D3 | AD3 | |
| | | D2 | AD2 | |
| | | D1 | AD1 | |
| | | D0 | AD0 | |
| | B port OUT B0000000H | D7 | BD7 | Reserved. |
| | | D6 | BD6 | |
| | | D5 | BD5 | |
| | | D4 | BD4 | |
| | | D3 | BD3 | |
| | | D2 | BD2 | |
| | | D1 | BD1 | |
| | | D0 | BD0 | |
| | B port IN B0000000H | D7 | BD7 | Reserved. |
| | | D6 | BD6 | |
| | | D5 | BD5 | |
| | | D4 | BD4 | |
| | | D3 | BD3 | |
| | | D2 | BD2 | |
| | | D1 | BD1 | |
| | | D0 | BD0 | |
| | A port OUT B0000004H | D7 | AD7 | WRITE command |
| | | D6 | AD6 | |
| | | D5 | AD5 | |
| | | D4 | AD4 | |
| | | D3 | AD3 | |
| | | D2 | AD2 | |
| | | D1 | AD1 | |
| | | D0 | AD0 | |
| | A port IN B0000004H | D7 | AD7 | READ command |
| | | D6 | AD6 | |
| | | D5 | AD5 | |
| | | D4 | AD4 | |
| | | D3 | AD3 | |
| | | D2 | AD2 | |
| | | D1 | AD1 | |
| | | D0 | AD0 | |

4. Circuit description

4-1. CPU

The AM29005 RISC chip is a low cost version of a 32-bit AM29000 microprocessor that has a 3-bus architecture. Using this architecture, the data bus is isolated from the instruction bus to allow using it in the burst mode to enhance a high speed operation by setting the address bus free. As 32 bits comprise an address, there are spaces of 4GB available. As its internal consists of four stage pipe line, a single cycle is needed to execute one instruction.



(1) Instruction burst accessing

The burst mode allows to execute an instruction without a wait, except that it needs to have two to three waits when an instruction address is sent, because it needs to latch the address.

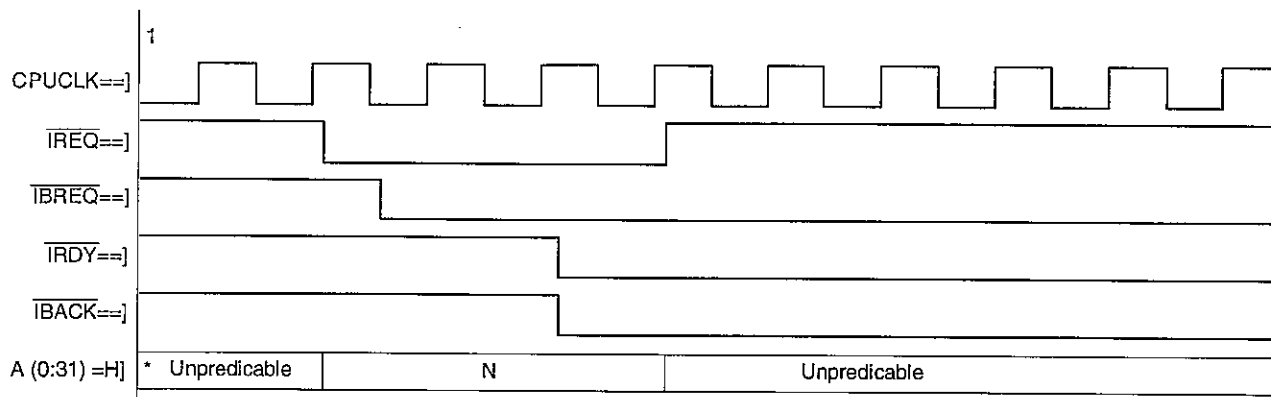


Fig. 13-4

(2) Data bus accessing (DRAM)

A single wait is needed as an 80ns chip is used for the DRAM.

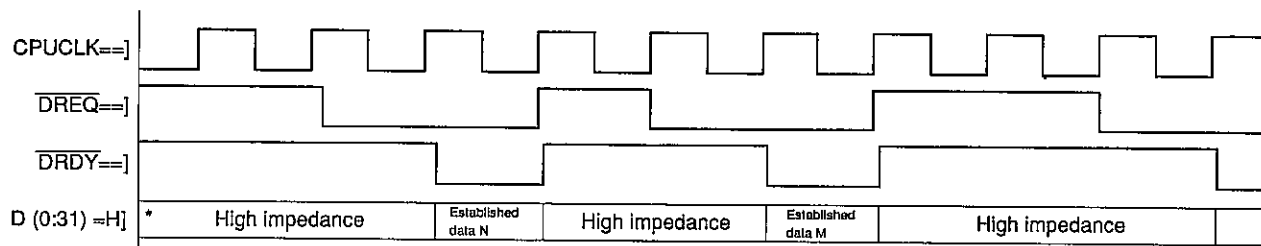


Fig. 13-5

(3) Data bus accessing (Centronics interface, general I/O port)

Access can be performed without wait by internal operations of the interface LSI.

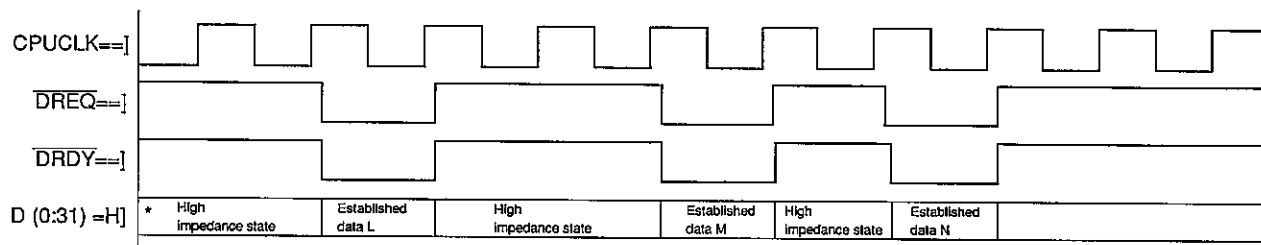


Fig. 13-6

(4) Data bus accessing (video interface, RS232C interface)

Access needs two waits by SIO in the interface LSI.

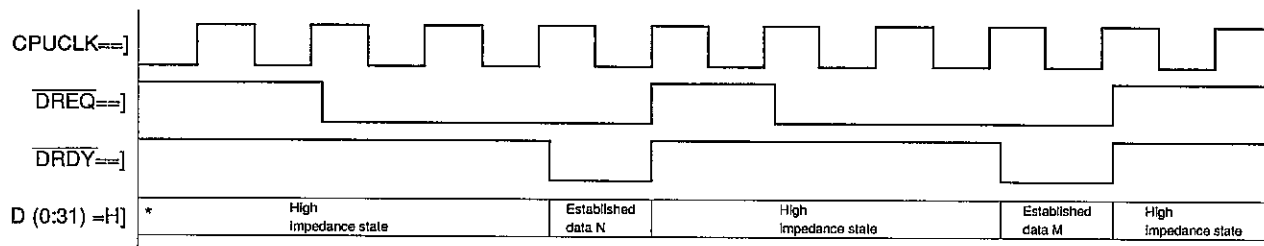


Fig. 13-7

DREQT1, OPT0~2: A combination of these signals can show the kind of data access.

$\overline{\text{IREQ}}$: Instruction access request signal. An active state of the signal shows that the address is an instruction address.

$\overline{\text{IBREQ}}$: Burst mode request signal for instruction access.

$\overline{\text{IBACK}}$: The memory system informs $\overline{\text{IBREQ}}$ that the burst mode is possible.

$\overline{\text{IRDY}}$: When this signal is active, the data on the data bus is received by the input buffer at a low to high transition of CPUCLK.

$\overline{\text{DREQ}}$: Data access request signal. An active state of the signal shows that the address is the data address.

$\overline{\text{DBREQ}}$: Burst mode request signal to data access.

$\overline{\text{DBACK}}$: The memory system informs to $\overline{\text{DBREQ}}$ that the burst mode is possible.

$\overline{\text{R/W}}$: Shows the direction of data access. Reading when high or writing when low.

$\overline{\text{BINV}}$: The rising edge of CPUCLK is sent at a late step of a cycle to inform that the cycle begun in this cycle is invalid.

STAT0~2: Shows the state of immediately preceding execution by a combined state of signals.

| STAT2 | STAT1 | STAT0 | Established data state |
|-------|-------|-------|--------------------------------------|
| 0 | 0 | 0 | At HALT or STEP |
| 0 | 0 | 1 | Pipe line hold |
| 0 | 1 | 0 | Load test instruction or halt/freeze |
| 0 | 1 | 1 | Wait mode |
| 1 | 0 | 0 | Return from interrupt |
| 1 | 0 | 1 | Interrupt |
| 1 | 1 | 0 | Discontinuous instruction fetch |
| 1 | 1 | 1 | Execution mode |

4-2. ROM address select

In the burst mode, when an address is created at the first cycle immediately after the burst started, the address bus is set free until a next burst. Therefore, the address is created and sent to the ROM while the address bus is free. This circuit consists of three latches and two counters.

The high address is latched with the low address stored in the counter. At this point, the latch and counter outputs become the address of the ROM A. For the ROM B address, the high address is created the same as the ROM A and the low address is the signal that the address of the ROM A is further latched. Whereas, the low address of ROM B is the address delayed one clock from the low address of ROM A. A(2) is used to select ROM A and ROM B. ROM A is selected with A(2)=0 and ROM B is selected with A(2)=1.

$\overline{\text{LADRLOAD}}$: With an active state of the signal, the low address is loaded to the counter at a low to high transition of SYSCLK.

$\overline{\text{LADRCNT}}$: With an active state of the signal, the low address is incremented in synchronization with SYSCLK.

$\overline{\text{BLATCH}}$: With an active state of the signal, the high address is latched at a low to high transition of SYSCLK.

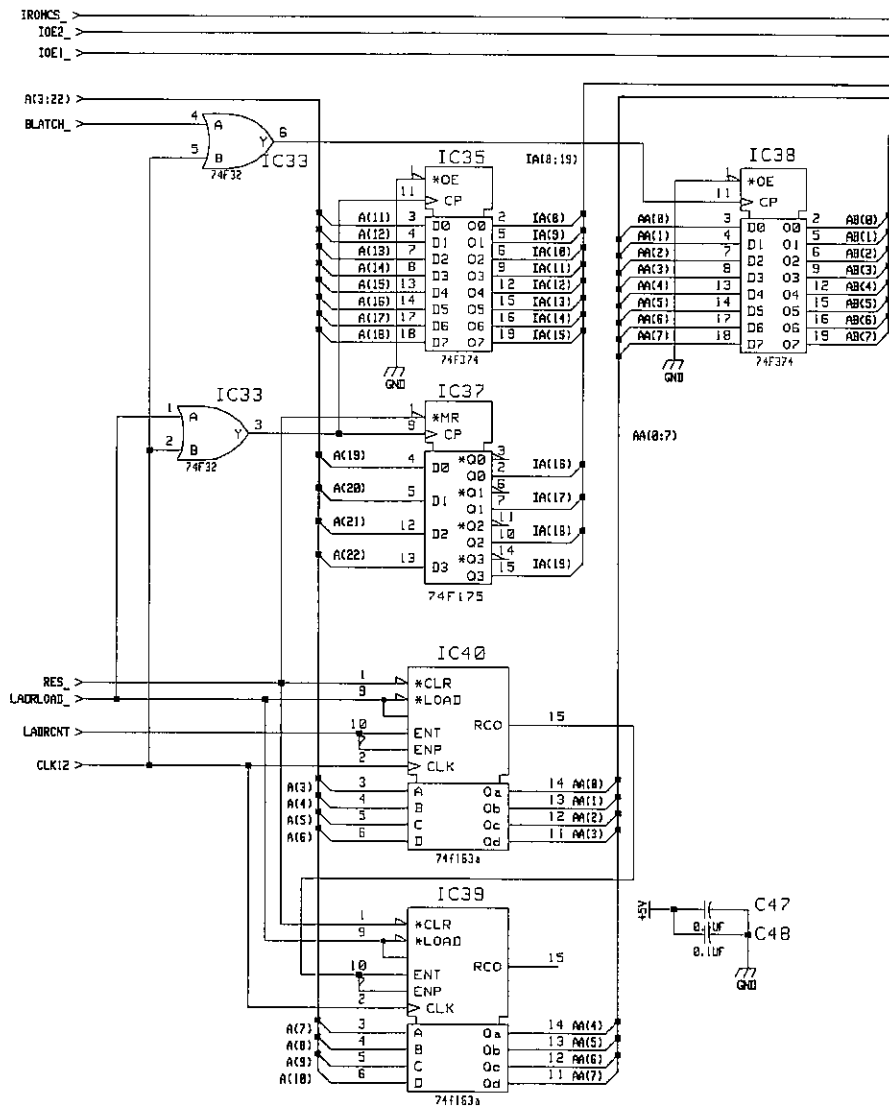


Fig. 13-8

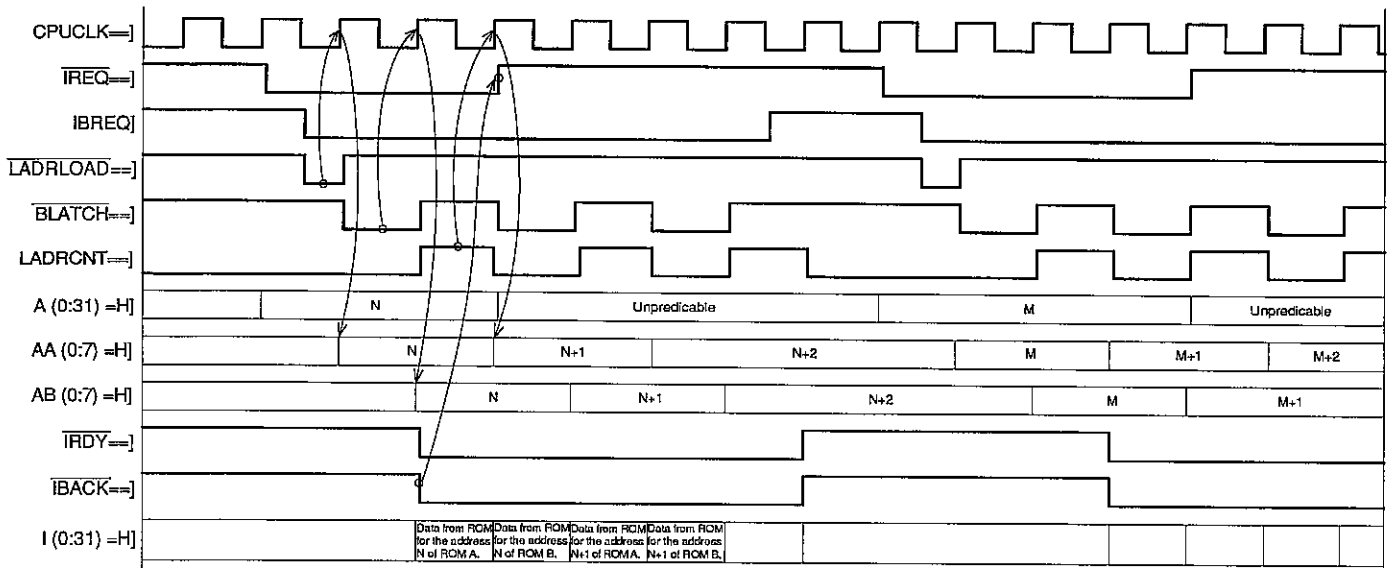


Fig. 13-9

4-3. Swap buffer

Resident font and outline data stored in the ROM that connected with the instruction bus through the data bus. To connect the isolated instruction buffer with the data bus, a swap buffer is needed. A F245 bidirectional buffer is used for this buffer.

4-4. Data buffer

A bidirectional buffer F245 is used to drive the expansion I/O port, font cards, and expansion memory data.

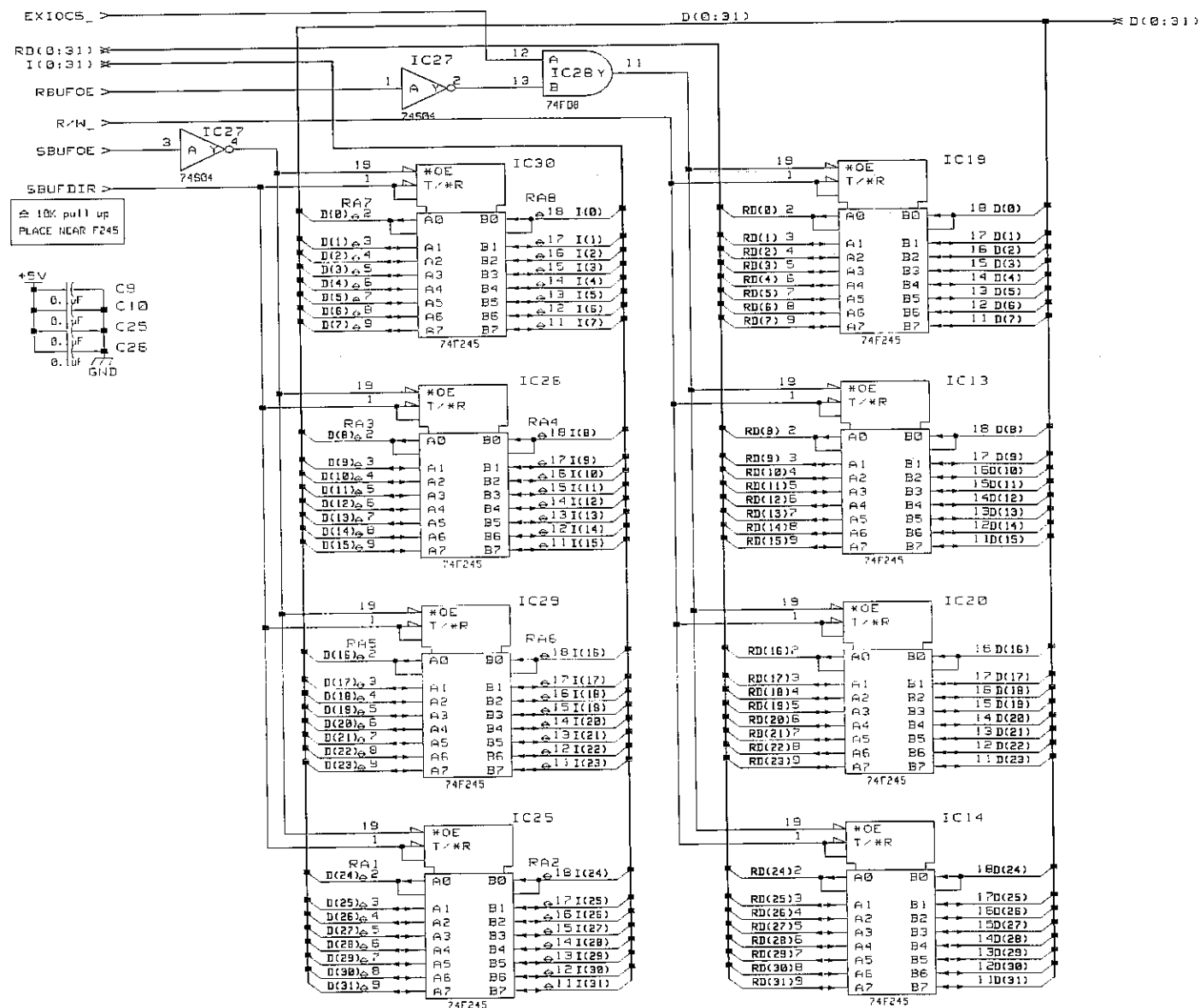


Fig. 13-10

4-5. DRAM address select

This circuit exists to select the DRAM latch address from the column address based on the refresh address from the interface LSI and the data from the CPU.

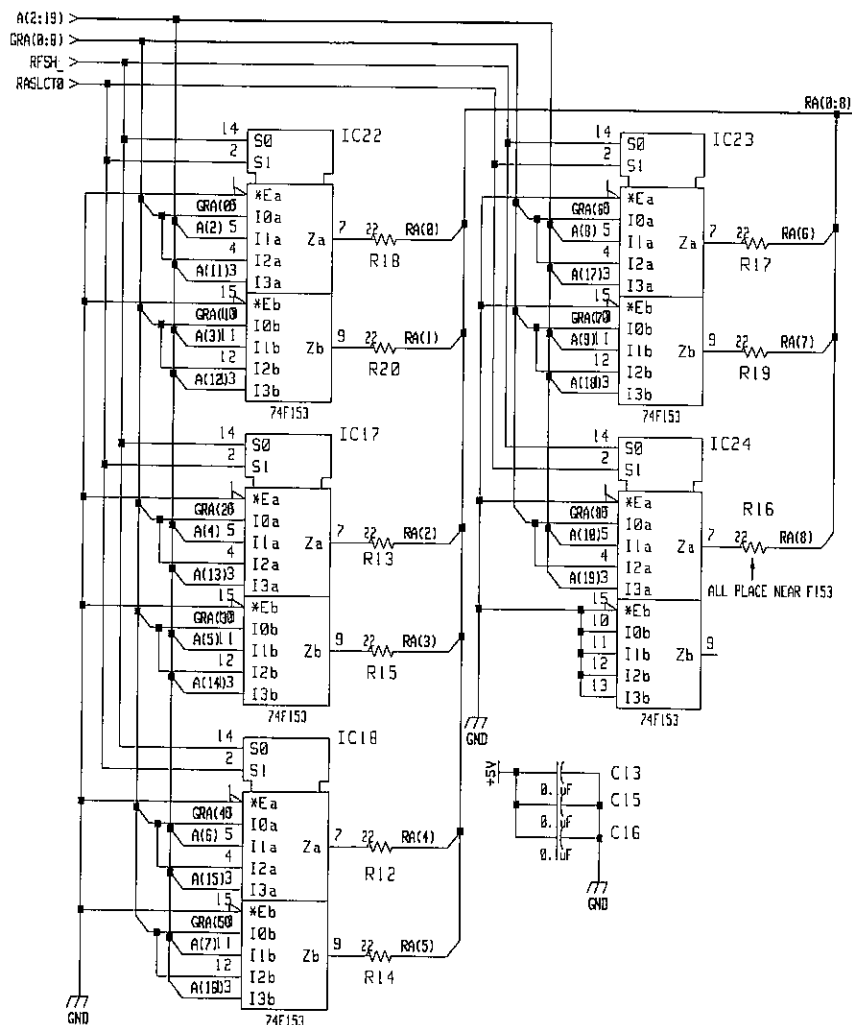


Fig. 13-11

4-6. Clock driver

The interface LSI needs the source frequency for the 19.66MHz oscillator and CPUCLK that the source frequency is divided into two. The CPU has a 90pF capacitor that defined to have 5ns rise and fall times. To meet this requirement, three driver outputs are used.

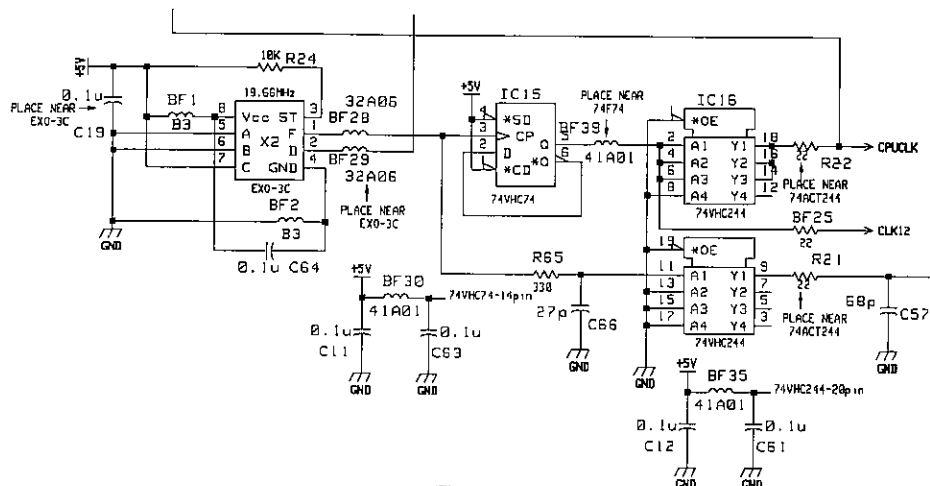


Fig. 13-12

4-8. Interface LSI

This LSI is a CMOS process gate array comprising about 8000 gates.
Its internal logic is discussed below with the internal block diagram.

Block diagram of the interface LSI

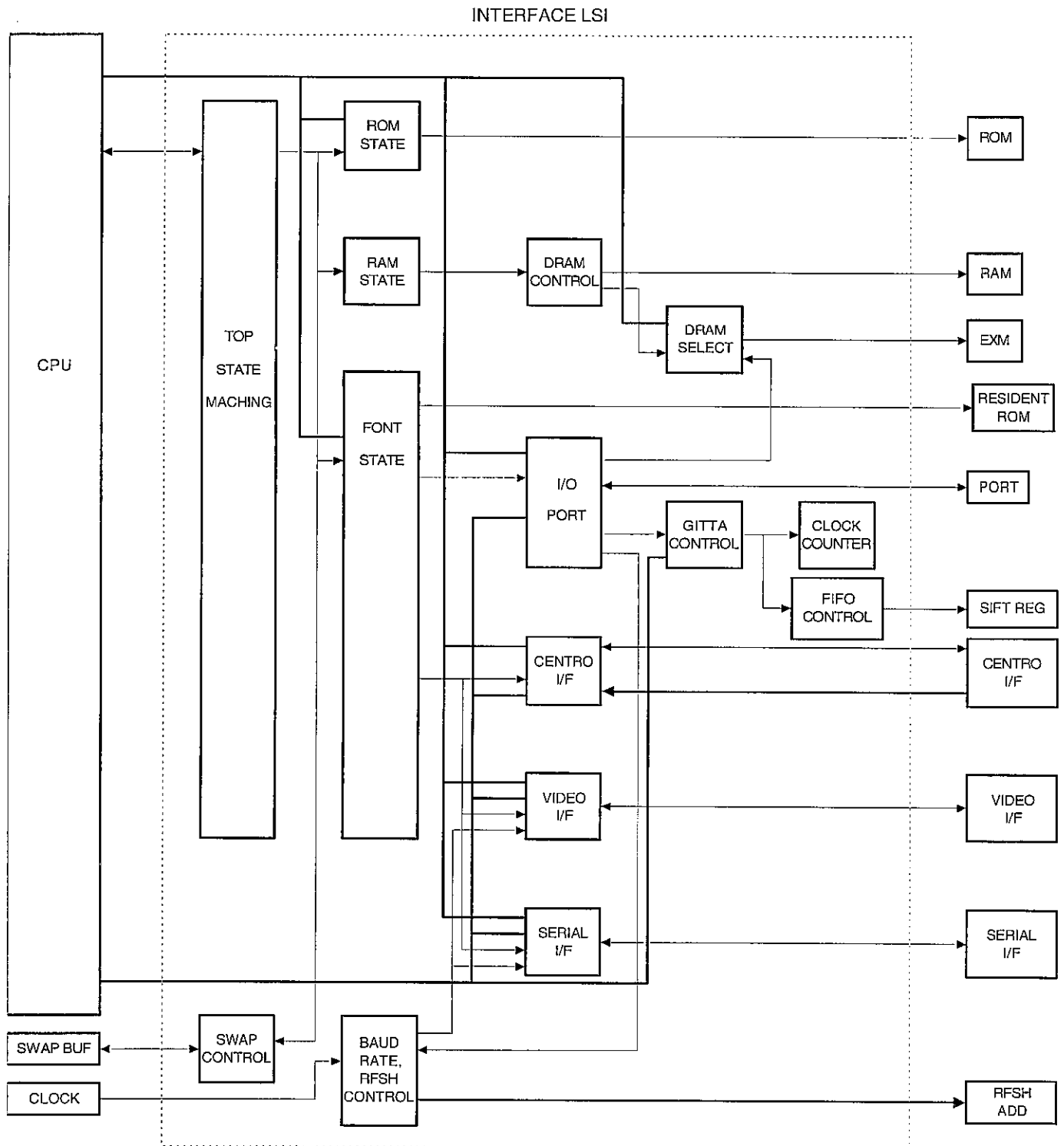


Fig. 13-18

4-8-3. DRAM controller

The figure below shows signal timings.

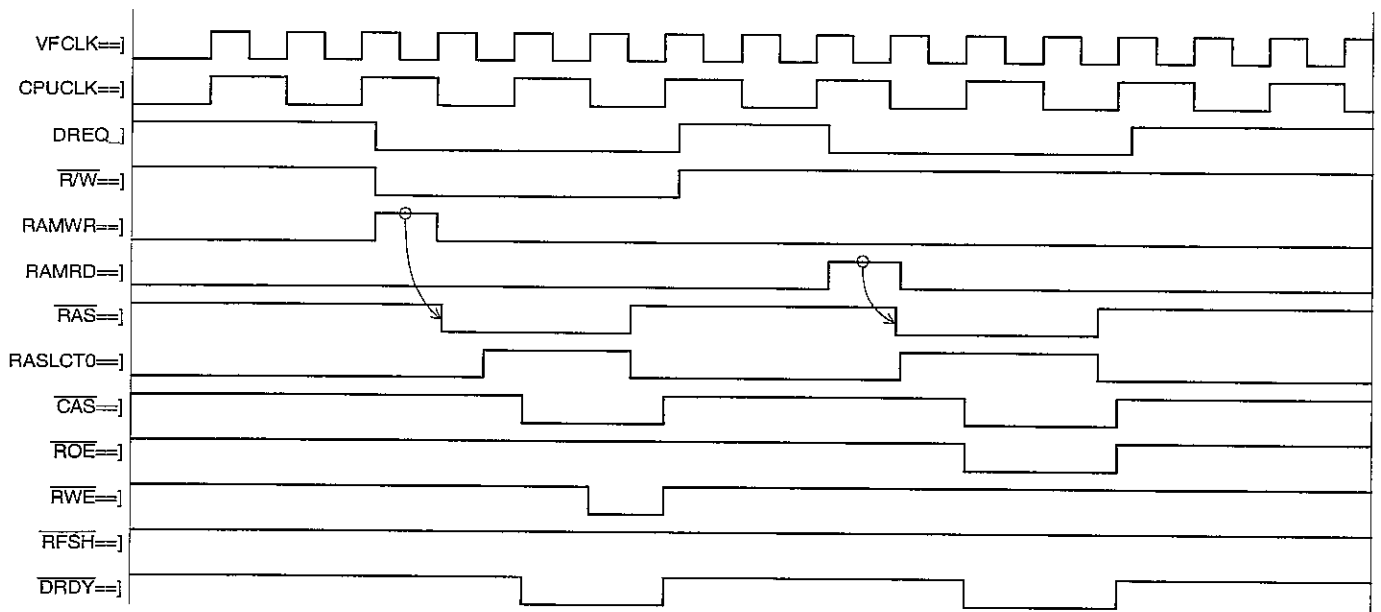


Fig. 13-20

CAS0~CAS3 are allocated to each byte of data bus. Which is to be active is controlled by DREQT1, OPT0~OPT2, A0, A1, and R/W.

| R/W | DREQT1 | OPT0 | OPT1 | OPT2 | A0 | A1 | CAS0 | CAS1 | CAS2 | CAS3 |
|-----|--------|------|------|------|----|----|------|------|------|------|
| 0 | 0 | 0 | 0 | 0 | X | X | 0 | 0 | 0 | 0 |
| 0 | 0 | 0 | 1 | 0 | X | 0 | 0 | 0 | 1 | 1 |
| 0 | 0 | 0 | 1 | 0 | X | 1 | 1 | 1 | 0 | 0 |
| 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 1 |
| 0 | 0 | 1 | 0 | 0 | 1 | 0 | 1 | 0 | 1 | 1 |
| 0 | 0 | 1 | 0 | 0 | 0 | 1 | 1 | 1 | 0 | 1 |
| 0 | 0 | 1 | 0 | 0 | 1 | 1 | 1 | 1 | 1 | 0 |
| 1 | X | X | X | X | X | X | 0 | 0 | 0 | 0 |

Table 3

For control of refresh, a refresh request signal is generated in a cycle of 13 μ s that goes into action with higher priority than data. However, if requested in a middle of an access cycle, it waits until the cycle has been complete. RAS only refresh is done in the refresh cycle. Its timing is shown in the figure below. The refresh address is incremented upon completion of the refresh cycle.

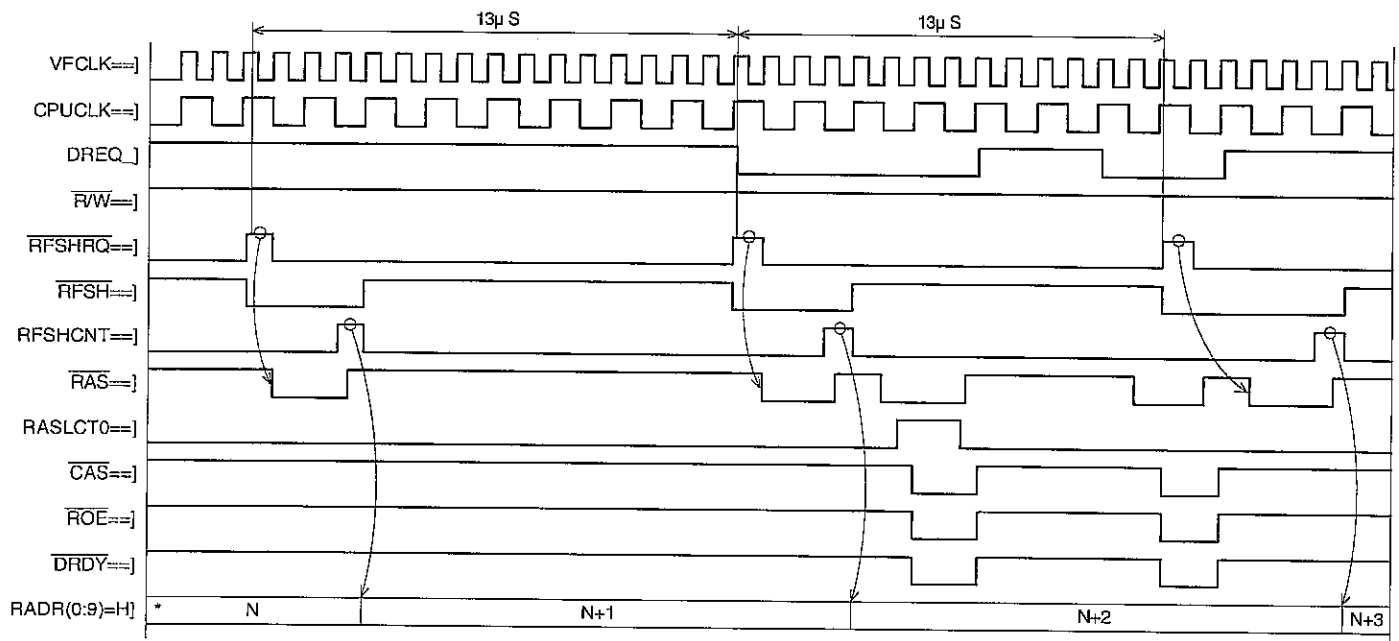


Fig. 13-21

4-8-4. Automatic expansion memory allocation

There are three kinds of expansion memories of 1MB, 2MB, and 4MB that allows to expand the memory up to 8MB using two slots. Memory allocation for those two slots will be done automatically by the LSI. For two slots are connected in series, a line memory would be available without care in terms of software.

To achieve this, the memory capacity on the slot 1 is scanned and its value is written in the port. The LSI compared the port output with address and controls the expansion memory gate signals G1~G3, EXRST1, and EXRST2.

4-8-5. FIFO control

Read and write to FIFO is done asynchronous. There is a rule to do it within 10ms after write to read in the case of the asynchronous mode. Because 10ms equals to four lines, the CPU controls that the write is done after SYNCRSTR is received and read should start after four lines.

To write, it can be achieved without a wait in synchronization with the CPU after sending data to the FIFO port. The signal PAGE is used to reset write that is done when PAGE is inactive. It would not be reset if PAGE is active.

To read, VIDEO CLK is counted and RDEN is issued at every eight clocks. With a single clock delay from RDEN, LD is issued to write data in the shift register. The read will be cancelled in four lines after PAGE has turned active.

4-8-6. Centronics interface

The latch circuit is controlled by the LSI to take care of the Centronics interface. All input signals are received by the Schmitt trigger circuit, and the output has the capacity to drive 4mA.

4-8-6-1. Signal description

- (a) STB (input, low active)
Sync signal used to read data.
 - (b) DATA1 to DATA8 (input)
Represents information from the first to eight bits.
 - (c) ACK (input, active low)
Acknowledge to STB input which is received when data input is terminated.
This signal is also issued when BUSY turns from high to low during initialization.
 - (d) BUSY (active high, output)
Indicates that data input is not enabled.
This signal is issued in one of the following:
 - (i) During processing of the receive data
 - (ii) During initialization
 - (iii) During alarm
 - (iv) When the buffer is full.
 - (e) PE (output, active high)
This signal is issued when a paper empty exists.
 - (f) SELECT (output, active high)
High when in the on-line mode and low in the off-line mode.
On-line mode is established in one of the following:
 - (i) Upon completion of initialization
 - (ii) When the ONLINE switch is pressed in the off-line mode.
- NOTE: On-line mode would not be established in the alarm mode for the above (i) and (ii).
- On-line mode is established in one of the following.
- (i) When the ONLINE switch pressed in the off-line mode.
 - (ii) When in the alarm.
- (g) INPUTPRIM (input, active low)
It goes into the initialization mode when this signal is received.

- (h) FAULT (output, active low)

This signal is issued when in the alarm mode.

It goes into the off-line mode when this signal is issued.

4-8-6-2. Data receiving flow

Explanation of the Centronics interface data receive flow

- ① The host sets up DATA8 to DATA1 and asserts STB.
- ② At a leading edge of STB, BUSY is returned to the host.
- ③ At a trailing edge of STB, the interrupt signal CEINT is asserted to inform the CPU that there was a data reception.
- ④ At a trailing edge of STB, data is latched in the data receive latch.
- ⑤ Awaits with CEINT until the CPU recognizes it.
- ⑥ As the CPU recognizes the interrupt, CEINT is negated and the data is read in the receive latch.
- ⑦ At the moment it became enabled to receive the next data, ACK is asserted to request the next data.
- ⑧ After negating ACK, BUSY is negated and a single byte receive sequence terminates.

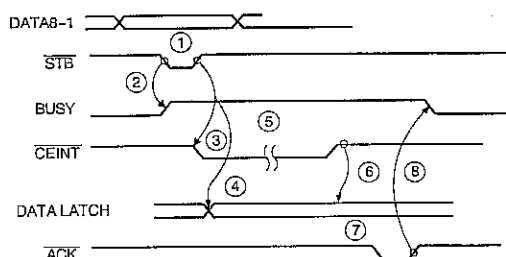


Fig.13-22. Receiving flow

4-8-6-3. Centronics interface timings

The Centronics interface timings can be selected with the operation panel.

TIMING 1 (DATA TRANSFER STANDARD TIMING) (Centronics MODEL 703)

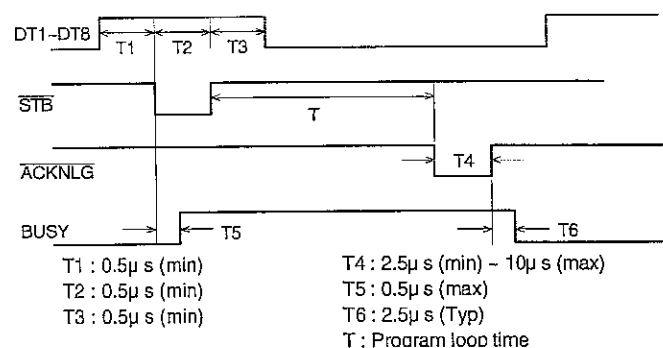


Fig. 13-23

Power On Standard Parallel Interface Timing

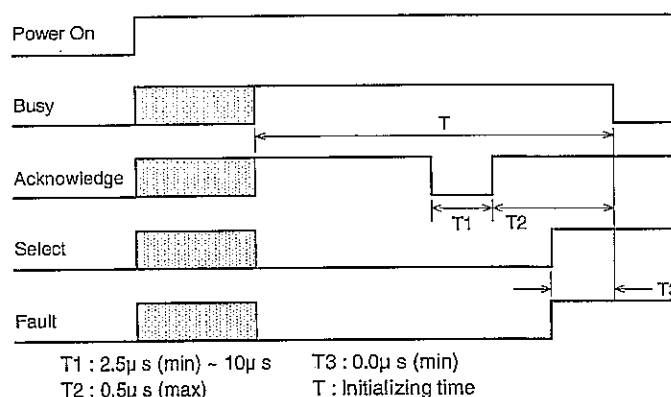


Fig. 13-24

Input Prime Timing Standard Parallel Interface Timing

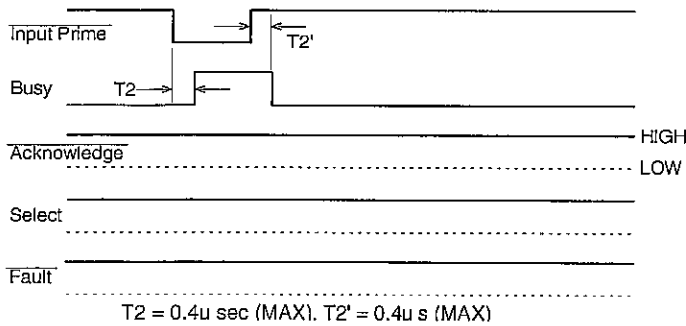


Fig. 13-25

Input Prime Timing Alternate Parallel Interface Timing

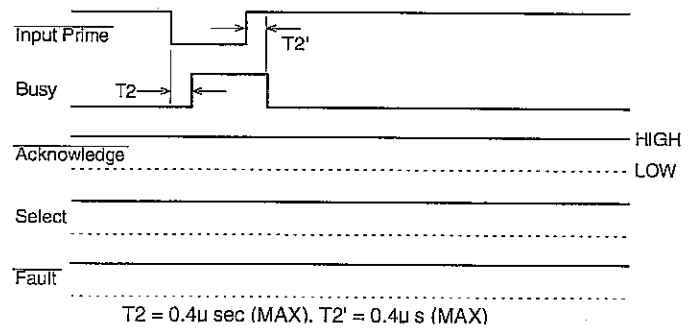


Fig. 13-29

ON LINE/OFF LINE Selection Standard Parallel Interface Timing

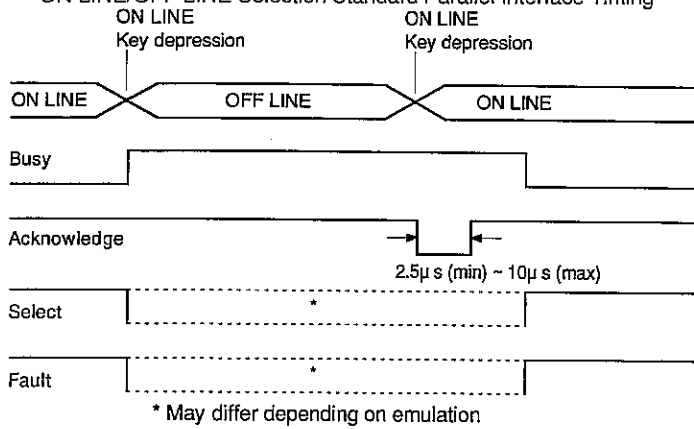


Fig. 13-26

ON LINE/OFF LINE Selection Alternate Parallel Interface Timing

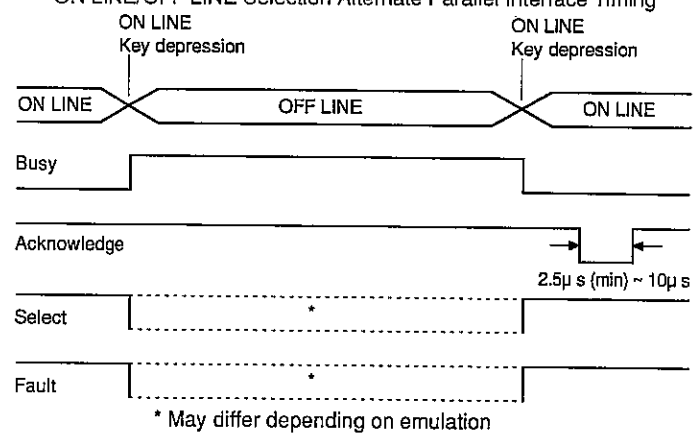


Fig.13-30. Centronics interface timing

TIMING 2 (DATA TRANSFER ALTERNATE TIMING)

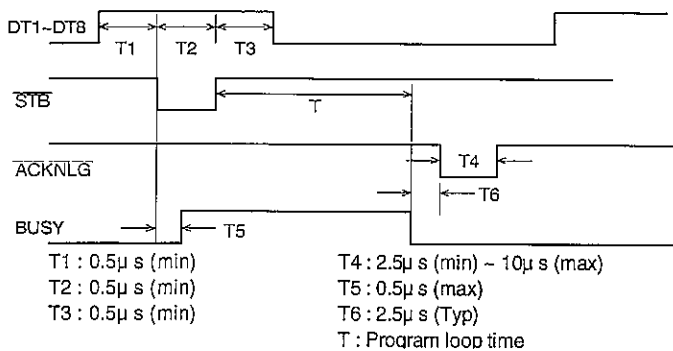


Fig. 13-27

TIMING 3 (DATA TRANSFER ALTERNATE TIMING)

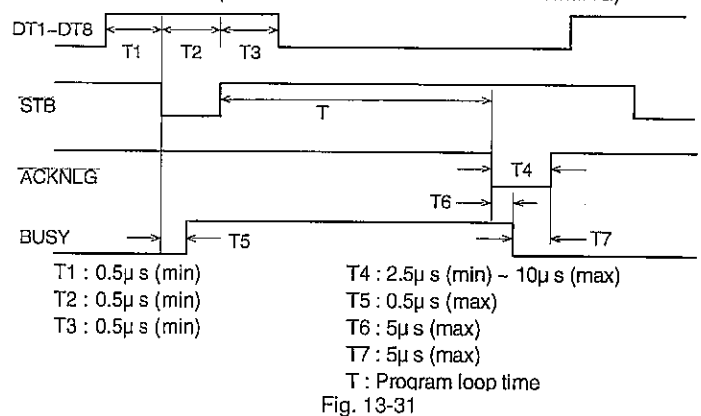


Fig. 13-31

Power On Alternate Parallel Interface Timing

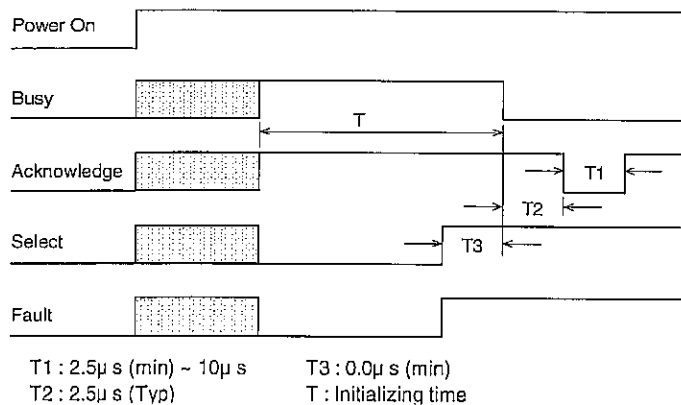


Fig. 13-28

Power On Alternate Parallel Interface Timing

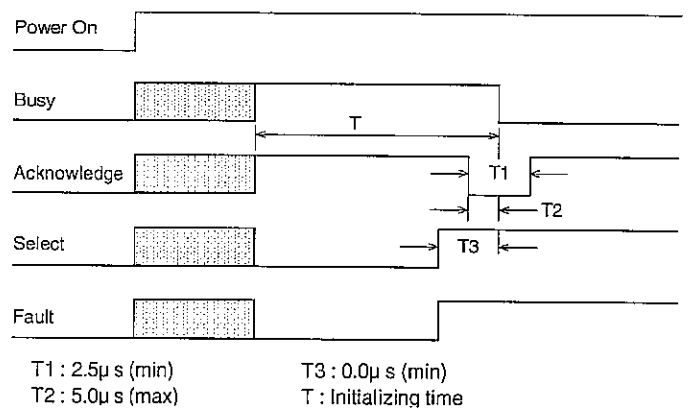


Fig. 13-32

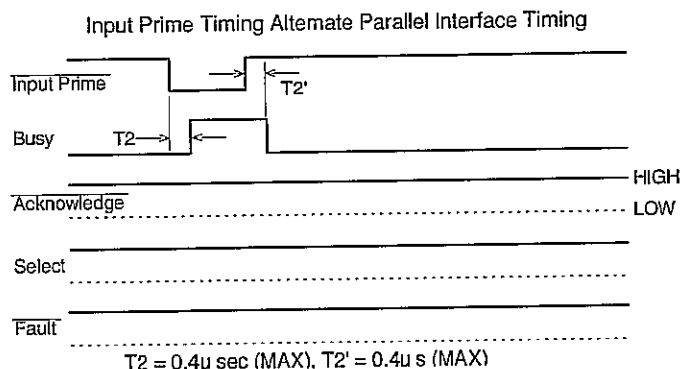


Fig. 13-33

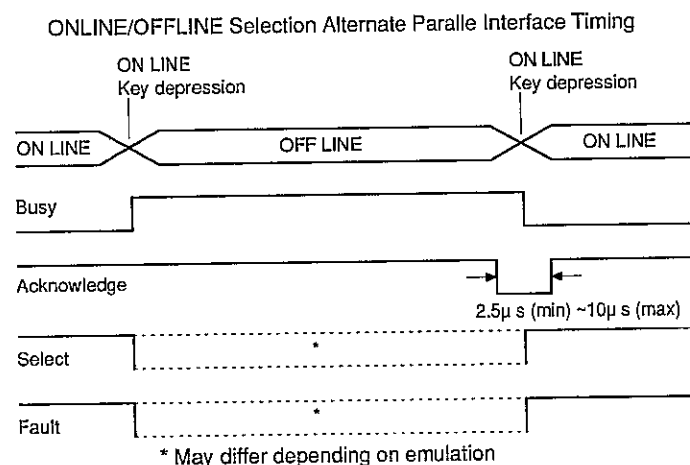


Fig. 13-34

4-8-6-5. Interfacing signals

The Centronics Parallel interface consists of a 36 pin connector. The signals on the 36 pin interface connector are:

| Pin | Signal Name | Pin | Signal Name |
|-----|----------------|-----|-------------|
| 1 | STB | 19 | STB Ret |
| 2 | DATA 1 | 20 | DATA 1 Ret |
| 3 | DATA 2 | 21 | DATA 2 Ret |
| 4 | DATA 3 | 22 | DATA 3 Ret |
| 5 | DATA 4 | 23 | DATA 4 Ret |
| 6 | DATA 5 | 24 | DATA 5 Ret |
| 7 | DATA 6 | 25 | DATA 6 Ret |
| 8 | DATA 7 | 26 | DATA 7 Ret |
| 9 | DATA 8 | 27 | DATA 8 Ret |
| 10 | ACKNLG | 28 | ACKNLG Ret |
| 11 | BUSY | 29 | BUSY Ret |
| 12 | PE (Paper End) | 30 | PE Ret |
| 13 | SLCT | 31 | INPRM |
| 14 | AUTO LF | 32 | FAULT |
| 15 | NC | 33 | GND |
| 16 | GND (0V) | 34 | NC |
| 17 | Frame Ground | 35 | +5V |
| 18 | +5V | 36 | SLCT IN |

4-8-7 Video interface

The SIO is used to control the CPU internal. To access the SIO, the CPU needs to have two waits.

4-8-8. RS232C interface

The SIO implemented within the LSI issues TXD, DTR, and RTS and received RXD and DSR. To access this SIO, the CPU needs to have two waits.

4-8-9. General purpose port

Input and output shown in the port chart are created inside the LSI. This port is accessed without wait.

4-8-10. Jitter, left margin circuit

The jitter and the left margin circuit are provided in the controller side to send video clock from the controller side to the engine. The interface LSI is used to perform this operation.

The jitter circuit forms VIDEO CLK from 15.202MHz which is four times greater than 3.8MHz of video clock (300DPI), and send it out.

The left margin circuit can be adjusted with the counter value setting from the CPU. The adjustment unit is 4 dots.

4-9. EEPROM

This chip is a 4K-bit (256 x 8) CMOS process electrically erasable programmable ROM that interfaced two control signals of SCLK and SDA. Input and output signals are connected with the LSI.

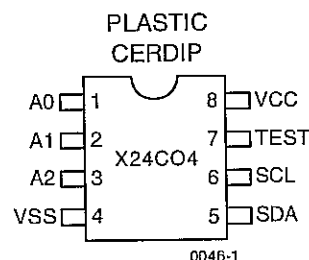


Fig. 13-35

Read & Write Cycle Limits

| Symbol | Parameter | Min | Max. | Units |
|--------------|---|-----|------|---------------|
| f_{SCL} | SCL Clock Frequency | 0 | 100 | KHz |
| T_1 | Noise Suppression Time Constant a: SCL SDA Inputs | | 100 | ms |
| t_{AA} | SCL Low to SDA Data Out Valid | 0.3 | 3.5 | μs |
| t_{BUF} | Time the Bus Must Be Free Before a New Transmission Can Start | 4.7 | | μs |
| $t_{HD:STA}$ | Start Condition Hold Time | 4.0 | | μs |
| t_{LOW} | Clock Low Period | 4.7 | | μs |
| t_{HIGH} | Clock High Period | 4.0 | | μs |
| $t_{SU:STA}$ | Start Condition Setup Time (for a Repeated Start Condition) | 4.7 | | μs |
| $t_{HD:DAT}$ | Data in Hold Time | 0 | | μs |
| $t_{SU:DAT}$ | Data in Setup Time | 250 | | ns |
| t_R | SDA and SCL Rise Time | | 1 | μs |
| t_F | SDA and SCL FALL Time | | 300 | ns |
| $t_{SU:STO}$ | Stop Condition Setup Time | 4.7 | | μs |
| t_{DH} | Data Out Hold Time | 300 | | ns |

Bus Timing

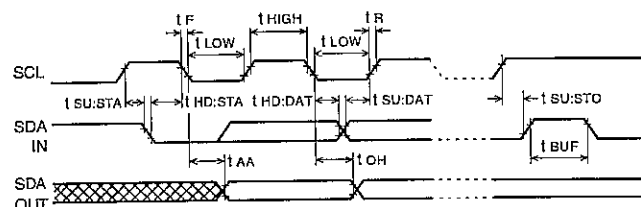


Fig. 13-36-A

Write cycle timing

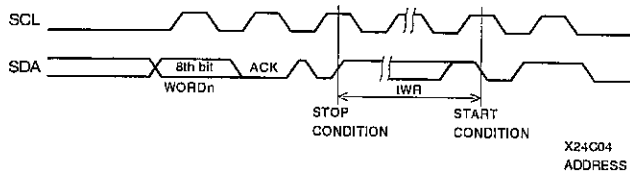


Fig. 13-36-B

4-10. Option device interrogation

Installation of option device is done by scanning the port described in the port chart to interrogate the use of option device. The circuit consists of the LS153.

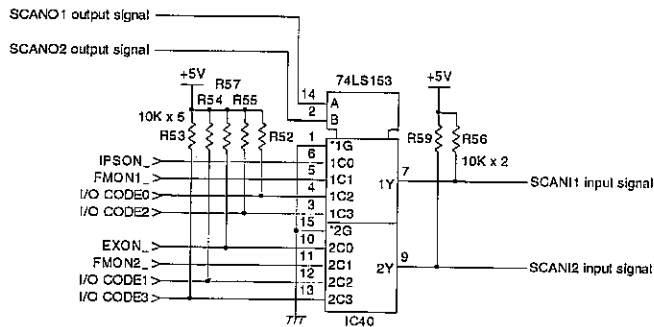


Fig. 13-37

4-11. HRT circuit

The HRT controls 300DPI data in digital to output in 600DPI engine and to enhance image data of 300DPI. This is composed of the gate array of approx. 3000 gates and FIFO of 8 lines.

<Outline and function of the HET>

This circuit divides a target pixel into 2 x 2 dot pattern according to the peripheral pixel pattern of the target pixel and print it, converting 300 dpi into 600 dpi.

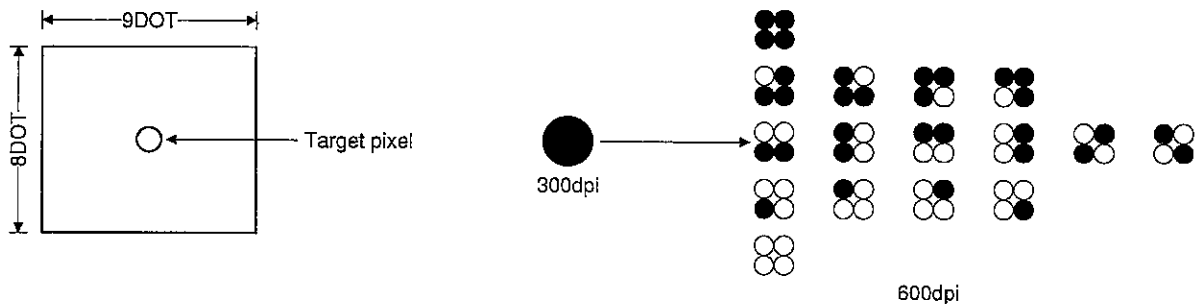


Fig. 13-38A

As shown in Fig. 13-38B, this circuit is connected between the PCU and the ICU to convert 300 dpi data from the ICU into 600 dpi data and send them to the PCU.

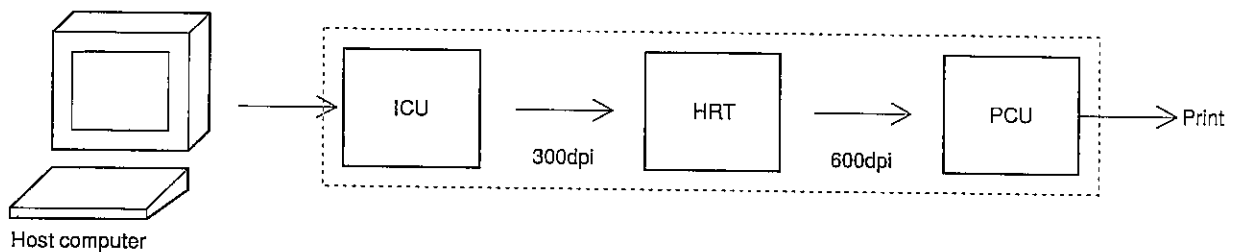


Fig. 13-38B

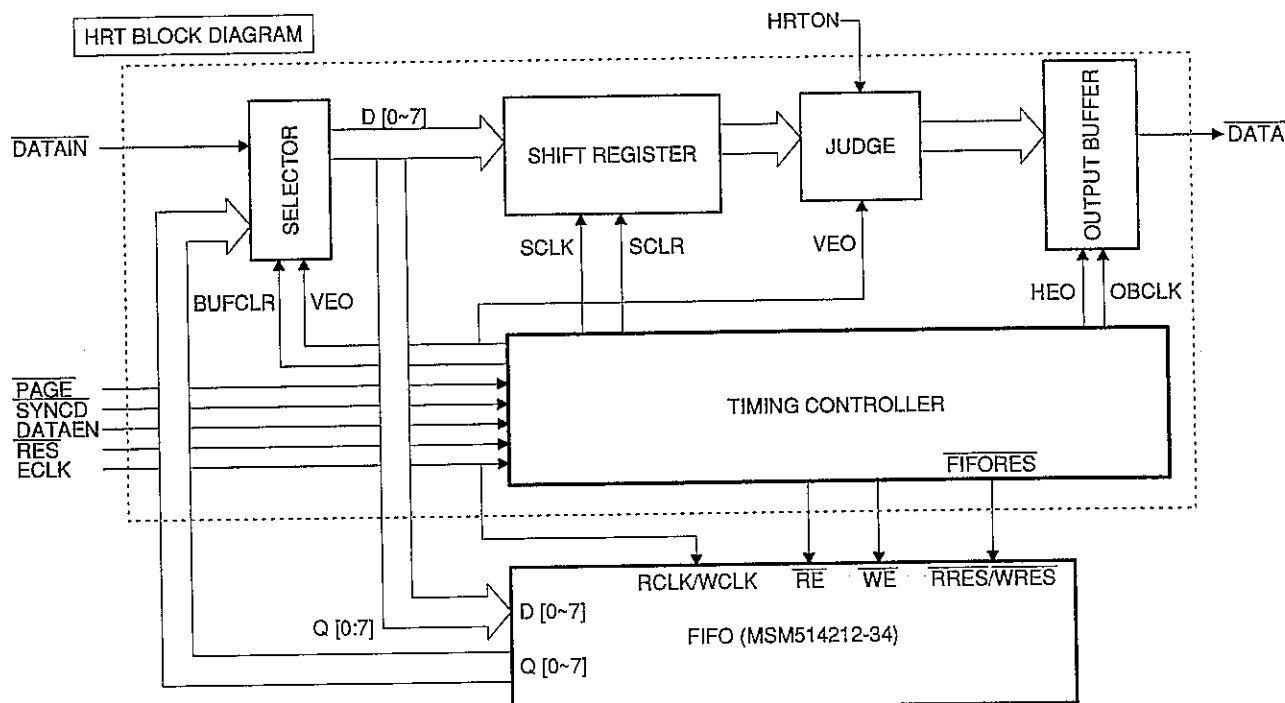


Fig. 13-38C

Gate array pin assignments

| PIN No. | I/O | SIGNAL | PIN No. | I/O | SIGNAL |
|---------|-----|---------|---------|-----|--------|
| 1 | O | RE | 23 | — | NC |
| 2 | I | DATAIN | 24 | I | SYNCN |
| 3 | — | GND | 25 | — | GND |
| 4 | I | Q4 | 26 | I | ECLK |
| 5 | I | Q5 | 27 | — | VDD |
| 6 | — | GND | 28 | — | GND |
| 7 | — | VDD | 29 | O | DATA |
| 8 | I | Q6 | 30 | — | GND |
| 9 | I | Q7 | 31 | — | VDD |
| 10 | O | WE | 32 | I | PAGE |
| 11 | O | FIFORES | 33 | I | RES |
| 12 | O | D7 | 34 | O | D3 |
| 13 | O | D6 | 35 | O | D2 |
| 14 | — | GND | 36 | — | GND |
| 15 | O | D5 | 37 | O | D1 |
| 16 | O | D4 | 38 | O | D0 |
| 17 | — | GND | 39 | — | VDD |
| 18 | — | VDD | 40 | I | Q0 |
| 19 | I | DATAEN | 41 | I | Q1 |
| 20 | I | HRTON | 42 | — | GND |
| 21 | I | TEST2 | 43 | I | Q2 |
| 22 | I | TEST1 | 44 | I | Q3 |

- **PAGE** : Input
Page initializing signal from the controller.
- **SYNCN** : Input
Horizontal synchronous signal (synchronized with CLK6)
- **DATAEN** : Input
Effective area signal from the controller (synchronized with CLK6)
- **ECLK** : Input
Reference clock from the controller
- **DATAIN** : Input
Input data of 300 dpi sent from the controller. They are sent once for two lines. (Described later.)

- **DATA** : Output
Output data of 600 dpi sent to the printer engine.
- **FIFORES** : Output
Initializing signal of read/write address pointer of FIFO.
- **RE** : Output
Read enable signal of FIFO
- **WE** : Output
Write enable signal of FIFO
- **D0-D7** : Output
Write data of FIFO
- **Q0-Q7** : Input
Read data of FIFO
- **HRTON** : Input
RET ON/OFF signal. ON at HIGH, OFF at LOW.
- **TEST1, TEST2** : Input
Gate array test signal

Outline of the gate array

In the timing control section, the **PAGE** signal starts the circuit and the **SYNCN** and **DATAEN** start each line.

When each line is started, read and write operations are performed from and to the FIFO and **RCLK** and **WCLK** are outputted. **RCLK** and **WCLK** are synchronized signals. The FIFO stores data of 8 lines.

The first line: **BUFCLR** signal is issued. Data read in the selector section from FIFO are ignored. Bits 1 ~ 7 are "0." Selection is made so that data from **DATAIN** (300DPI serial data) are outputted to bit 8. When these data are outputted to the next shift register, the FIFO writes data simultaneously.

The second line: The read data from the FIFO are selected to be outputted to the shift register.

The third line: Bit 7 of the read data from the FIFO and **DATAIN** are selected to be outputted to the shift register. The FIFO write is performed at the same time. After that, even number lines perform read only, and odd number lines perform read/write. This operation is repeated until **PAGE** becomes HIGH.

Data stored in the shift register are modified in the judgement circuit, converted into 600DPI, and sent to the engine.

The internal circuit is synchronized with **ECLK** (7.6MHz).

5. Option devices

5-1. Font card

When the font card is installed, $\overline{FCON1}$ and $\overline{FCON2}$ are turned low that the CPU recognizes the installation of the font card. When the font card is accessed, $\overline{CDCS1}$ and $\overline{CDSCS2}$ turned active and data are sent according to the \overline{CGOE} signal. The data output is sent onto the data bus through the bidirectional buffer.

Although the font data is in the 16 bits structure, the CPU receives it as 32 bits, ignoring the upper 16 bits. The CPU has a single wait cycle, then.

5-2. Expansion memory

Same as the standard RAM, 16 chips of 4M-bit DRAM are used as a unit of expansion memory. Two chips are required to expand it to 1MB, four chips for 2MB, and eight chips for 4MB. The timing is the same as the standard RAM and control signals are supplied through the buffer.

To select RAM, the signal obtained after decoding G1, G2, and G3 are used to set \overline{RAS} active or inactive through the \overline{EXRAS} gate.

5-3. PS board

The circuit of this board is the same as the ROM address select circuit mentioned in 4.2. When the Postscript board has been installed, the signal \overline{PSON} is forced low to inform the CPU that the Postscript board is installed.

5-4. RS232C board

5-4-1. Specifications

Communication: Start/stop mode ...Asynchronous
 Baud rate: 300, 600, 1200, 2400, 4800, 9600, 19,200 bps
 Transmission: Full duplex
 Synchronization: Start bit ... 1
 Stop bits ... 1
 Data bits ... 8
 Internal clock synchronization
 Error detection: Parity is not used

5-4-2. Interfacing signals

The interface connector signal table and the connector for RS232C interface is shown in Table 8-7.

Table 8.7 RS232C Signal

| NO. | SIGNAL |
|-----|-------------------------------------|
| 1 | FG (Frame Ground) |
| 2 | \overline{TXD} (Transmitted Data) |
| 3 | \overline{RXD} (Received Data) |
| 4 | RTS (Request to Send) |
| 6 | DSR (Data Set Ready) |
| 7 | GND (Signal Ground) |
| 20 | DTR (Data Terminal Ready) |

Outline View of Interface Connector

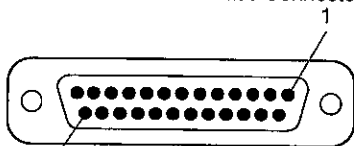


Fig. 13-39 DDK 17LE-1325C-28 (device side)

5-4-3. Description of RS232C interface signals

Transmitted Data (\overline{TXD})

Printer output. Data from the printer to the computer.

Received Data (\overline{RXD})

Printer input. Data from the computer to the printer.

Request To Send (RTS)

Printer output. This signal is high when there is power on in the printer.

Data Set Ready (\overline{DSR})

Printer input. This signal is not required for controller to receive data.

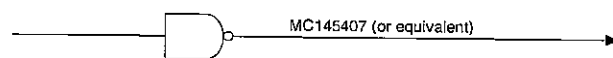
Data Terminal Ready (DTR)

Printer output. High signal indicates that the printer is ready and low signal indicates that the printer is busy.

5-4-4. Signal levels at RS232C interface

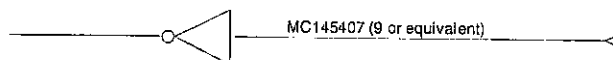
Transmit

Signals: \overline{TXD} , DTR, RTS



Receive

Signals: \overline{RXD} , DSR



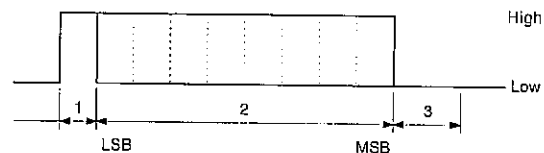
RS232C driven by 5V

Driver, Receiver

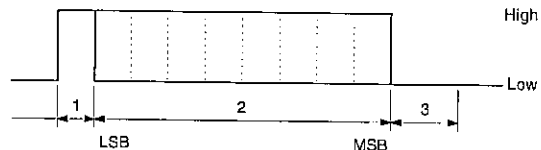
Receive signal level: High ...+3 to +15V
 Low ... -15 to -3V

Transmit signal level: High ...+3 to +15V
 Low ...-15 to -5V

Transmit data: \overline{TXD}



Receive data: \overline{RXD}



1. Start bit
2. 1-byte data
3. Stop bit(s)

Fig. 13-40

5-4-5. Serial interface protocol

Data Terminal Ready

A hardware handshake is available with the printer. The Data Terminal Ready (DTR) signal line is available for hardware handshake at pin 20 of the serial connector. This signal line is always operating, it does not require enabling.

The DTR signal line indicates whether the printer is "ready" or "not ready" for data. When the printer is ready for data, the DTR signal switches to a High (or low, if the DTR line is set for inverted operation). The printer will request data when the following three conditions exist:

1. when its 10K byte buffer has less than 6K bytes of data (has at least 4K bytes empty),
2. when it is ON-LINE, and
3. when it is not BUSY.

The DTR signal goes Low (high, if the DTR line is set for inverted operation) when the printer is not ready to accept data. Data will not be accepted by the printer when any one of the following conditions exist:

- ★ the I/O buffer has 450 bytes empty,
- ★ it is OFF-LINE, or
- ★ it is in a BUSY state (such as performing Self-Test).

Transitions on the line correspond to the transmissions of Xon (asserted) and Xoff (not-asserted).

The signal logic or "sense" of the DTR signal line can be switched to either active high or active low from the operator panel on the printer. To select the DTR line for active high polarity select DTR POLARITY=HI* using the Printer Operator Panel configuration menu; to select active low polarity set the configuration menu item to DTR POLARITY=L0*.

Xon/Xoff

Xon/Xoff is a data stream handshake protocol which sends Xon (DC1; 11hex) to the computer when the printer is able to accept data and sends Xoff (DC3; 13hex) when the printer is not ready for data.

The printer transmits an Xon when it is ready to accept more data from the host. The printer requests data when the following three conditions exist:

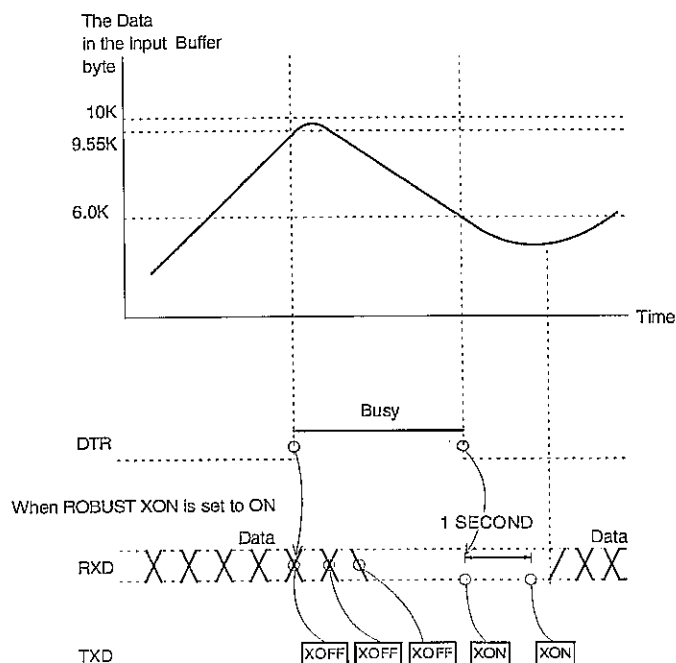
1. when its 10K byte buffer has less than 6K bytes of data (has at least 4K bytes empty),
2. when it is ON-LINE, and
3. when it is not BUSY.

If not data is received within approximately one second of the transmission of an Xon, the printer may be configured so that it sends additional Xon's at one second intervals until data is received. The ROBUST-XON operator Panel configuration menu item is used to select whether additional Xon's should be transmitted. If ROBUST-XON is set to On, additional Xon's will be transmitted at one second intervals until data is received. If ROBUST-XON is set to off, additional Xon's are not transmitted. The factory setting is ROBUST-XON set to On.

Xoff's are transmitted by the printer to indicate that the printer is not ready to accept data. An Xoff is transmitted when any one of the following conditions exist:

- ★ the I/O buffer has 450 bytes empty,
- ★ it is OFF-LINE, or
- ★ it is in a BUSY state (such as performing Self-Test).

If additional data bytes are received from the host after the Xoff is transmitted, additional Xoff characters are transmitted everytime it receives additional data. Also, an Xoff is transmitted as soon as the Message Display changes to WARMING UP when the printer is powered on.



5-5. RS232C AppleTalk board

The RS232C circuit is as described in the previous paragraphs.

An SCC 85C30 is used for the AppleTalk and runs in the FM mode of the SDLC synchronous protocol.

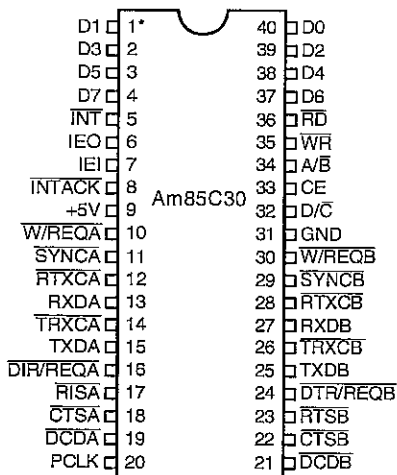
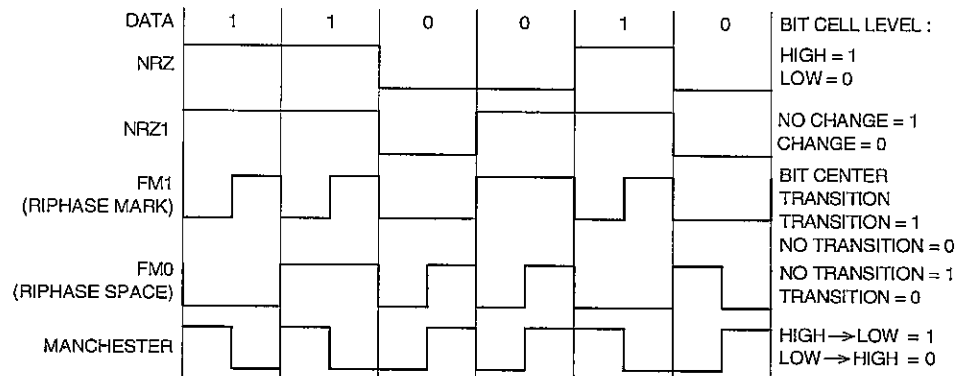


Fig. 13-41



Data encode method

Data encode method

Fig. 13-42

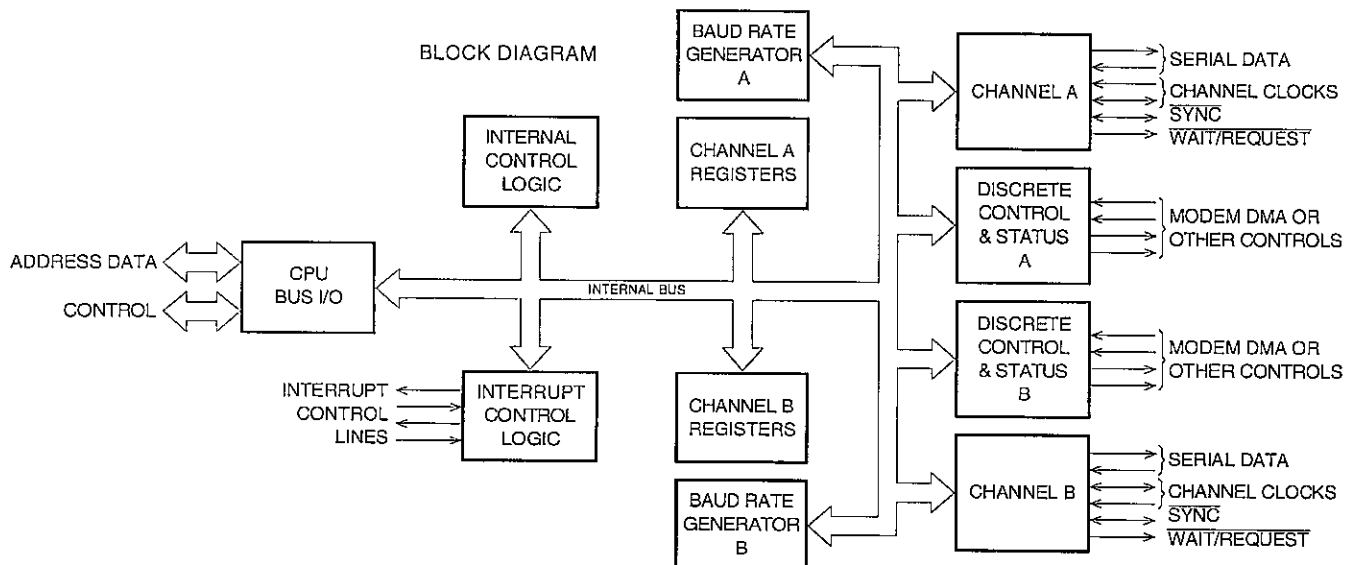


Fig. 13-43

6. Firmware basic structure

1. Basic structure for the JX-9600 controller firmware

1-1. Memory

The memory of this controller is configured as described next.

ROM (standard)

| | |
|--------------|-------------|
| Program | About 1MB |
| Bitmap font | About 500KB |
| Outline font | About 500KB |
| Total | 2MB |

RAM (standard)

| | |
|--------------|-------------|
| CPU work RAM | About 300KB |
| User RAM | About 700KB |
| Total | 1MB |

For the expansion RAM option has two slots of 1 and 2 that enables to add up to 8MB using 1MB, 2MB, and 4MB configuration.

1-2. Emulation

Given next is the emulations that supported by this controller.

| | |
|----------|-----------------------|
| HP LJIII | PCL Level 5 HPGL/2 |
|----------|-----------------------|

FX-80
IBM Proprinter/Graphics printer
Hex dump
PS board

To operate in the Postscript mode, the Postscript card option must be installed on the main board.

1-3. Fonts

Listed below is the resident fonts within the controller.

NOTE: Regarding the outline fonts, their font names are trade mark registered for Hewlett Packard (font supplied by AGFA) and Adobe (supplier of a variety of fonts). Therefore, font names referred to by this printer differ from those of Hewlett Packard and Adobe.

- HP mode

BIT MAP FONT (Manufactured by Bitstream)

| TYPEFACE | PITCH | POINT | TREATMENT |
|--------------|-------|-------|-----------|
| COURIER | 12 | 10 | MEDIUM |
| COURIER | 12 | 10 | BOLD |
| COURIER | 12 | 10 | ITALIC |
| COURIER | 10 | 12 | MEDIUM |
| COURIER | 10 | 12 | BOLD |
| COURIER | 10 | 12 | ITALIC |
| LINE PRINTER | 16.6 | 8.5 | MEDIUM |

OUT LINE FONT (Manufactured by Bitstream)

| TYPEFACE | HP TYPEFACE NAME | TREATMENT |
|---------------------|---------------------|-------------|
| Dutch 801 | (CG TIMES) | MEDIUM |
| Dutch 801 | (CG TIMES) | ITALIC |
| Dutch 801 | (CG TIMES) | BOLD |
| Dutch 801 | (CG TIMES) | BOLD ITALIC |
| Swiss 742 | (UNIVERS) | MEDIUM |
| Swiss 742 | (UNIVERS) | ITALIC |
| Swiss 742 | (UNIVERS) | BOLD |
| Swiss 742 | (UNIVERS) | BOLD ITALIC |
| Swiss 742 Condensed | (UNIVERS CONDENSED) | MEDIUM |
| Swiss 742 Condensed | (UNIVERS CONDENSED) | ITALIC |
| Swiss 742 Condensed | (UNIVERS CONDENSED) | BOLD |
| Swiss 742 Condensed | (UNIVERS CONDENSED) | BOLD ITALIC |
| ITC ZAPF DINGBAT | (ITC ZAPF DINGBAT) | |
| STICK FONT | | |

- FX-80 mode
 - PICA
 - PICA SCRIPT
 - ELITE
 - ELITE SCRIPT
 - CONDENCE
 - CONDENCE SCRIPT
- IBM Proprinter mode
 - PICA
 - PICA SCRIPT
 - ELITE
 - ELITE SCRIPT
 - CONDENCE
 - CONDENCE SCRIPT
- IBM Graphics printer mode
 - PICA
 - PICA SCRIPT
 - CONDENCE
 - CONDENCE SCRIPT
 - COURIER
- Hex dump mode
 - COURIER
 - CONDENCE SCRIPT

- PS mode (option)

| This printer Font Name | Adobe Font Name |
|---|------------------------------------|
| Geometric 711 ITC Avant Garde-Gothic Demi | ITC Avant Garde-Demi |
| Geometric 711 ITC Avant Garde-Gothic Demi/Oblique | ITC Avant Garde-Demi/Oblique |
| Geometric 711 ITC Avant Garde-Gothic Book | ITC Avant Garde-Book |
| Geometric 711 ITC Avant Garde-Gothic Book/Oblique | ITC Avant Garde-Book/Oblique |
| Swiss 721-Normal | Helvetica-Normal |
| Swiss 721-Oblique | Helvetica-Oblique |
| Swiss 721-Bold | Helvetica-Bold |
| Swiss 721-Bold/Oblique | Helvetica-Bold/Oblique |
| Swiss 721 Narrow-Normal | Helvetica Narrow-Normal |
| Swiss 721 Narrow-Oblique | Helvetica Narrow-Oblique |
| Swiss 721 Narrow-Bold | Helvetica Narrow-Bold |
| Swiss 721 Narrow-Bold/Oblique | Helvetica Narrow-Bold/Oblique |
| Century 702 Century Schoolbook-Normal | New Century Schoolbook-Normal |
| Century 702 Century Schoolbook-Italic | New Century Schoolbook-Italic |
| Century 702 Century Schoolbook-Bold | New Century Schoolbook-Bold |
| Century 702 Century Schoolbook-Bold/Italic | New Century Schoolbook-Bold/Italic |
| Chancery 801 ITC Zapf Chancery-Medium/Italic | ITC Zapf Chancery-Medium/Italic |
| Courier-Normal | Courier-Normal |
| Courier-Italic | Courier-Oblique |
| Courier-Bold | Courier-Bold |
| Courier-Bold/Italic | Courier-Bold/Oblique |
| Dutch 801-Normal | Times-Normal |
| Dutch 801-Italic | Times-Italic |
| Dutch 801-Bold | Times-Bold |
| Dutch 801-Bold/Italic | Times-Bold/Italic |
| Revival 711 ITC Bookman-Light | ITC Bookman-Light |
| Revival 711 ITC Bookman-Light/Italic | ITC Bookman-Light/Italic |
| Revival 711 ITC Bookman-Demi | ITC Bookman-Demi |
| Revival 711 ITC Bookman-Demi/Italic | ITC Bookman-Demi/Italic |
| Zapf Calligraphic 801-Normal | Palatino-Roman |
| Zapf Calligraphic 801-Italic | Palatino-Roman Italic |
| Zapf Calligraphic 801-Bold | Palatino-Bold |
| Zapf Calligraphic 801-Bold/Italic | Palatino-Bold/Italic |
| Symbol | Symbol |
| ITC Zapf Dingbats | ITC Zapf Dingbats |

2. Description of internal operation

2-1. General

The basic structure consists of the following four categories.

1. PLI (Printer Language Interpreters)
2. PDI (Page Description Interface)
3. Supervisor
4. BIOS

2-2. PLI (Printer Language Interpreters)

This is where the data received from the host is translated. There are PLI's for the HP LaserJet III, four emulators, and Postscript (option). Operation starts according to the emulator selected on the keyboard.

NOTE: The program developed by Phoenix Technologies Ltd., is used for PLI of the HP LaserJet III.

2-3. PDI (Page Description Interface)

The Page description interface is used for image kernel and graphics interface for bitmap raster devices. This is where the command interpreted by PLI is used to create the data to print on the printer, in which contained groups of functions needed to draw straight line for HP-GL/2 and circle. This part is common to all regardless of emulators.

NOTE: The program developed by Phoenix Technologies Ltd., is used for PDI of the HP LaserJet III.

2-4. Supervisor (printer OS)

As the system operates in the multitask mode, the task-to-task control and printer engine control are managed by the supervisor. This consists of four blocks.

1. Host I/O
2. Printer state
3. Panel manager
4. Option manager

2-4-1. Host I/O

This is where the data from the host is controlled. All input buffers contains data that give instruction to the emulators (PLI) for translation.

2-4-2. Printer state

The operating state of the printer engine is monitored. When an error is encountered, the error state is informed to the task. It also controls the printer engine startup and paper release and deletion of internal data.

2-4-3. Panel manager

Used to control the control panel and informs display and change to the relevant tasks.

2-4-4. Option manager

Used to control the EEPROM.

2-5. BIOS

This is a routine employed to directly control the hardware that consists of the power-on initialize interrupt routine and I/O control.

1. Parallel interrupt routine
2. RS232C interrupt routine
3. AppleTalk interrupt routine
4. Front panel (PCU interrupt routine)
5. Engine (PCU interrupt routine)
6. Hsync interrupt routine
7. EEPROM read/write routine
8. Timer interrupt routine

3. Actual data flow

Here, explanation will be given for the internal operation from the reception of data through the Centronics interface until the completion of print.

1. The data received from the host is recognized by the parallel interrupt and stored in the input buffers within the parallel interrupt routine.
2. As the data were stored in the input buffers, the PLI task starts to run by the supervisor.
3. The PLI interpretes the ESC commands and creates an intermediate language (display list) using functions in PDI.
4. Above 1 to 3 are repeated until the paper release command is received or turned over to a next page.
5. If paper eject occurred, the print start request is issued to the supervisor (printer state).
6. A pre-feed command is sent to the printer engine, and the band buffers start to work based on the display list.
7. Band buffers reside on the internal RAM. The capacity of buffer will change as mentioned next according to the page protection mode setting and paper size.

Page protection at OFF

Five bands of 308 bytes wide, 100 lines long.

Paper protection at LE

Frame buffer of 308 bytes wide, 3300 lines long.

Page protection at LL

Frame buffer of 308 bytes wide, 4200 lines long.

Page protection at A4

Frame buffer of 308 bytes wide, 3507 lines long.

8. Bits are developed until the band buffers (frame buffer) fully occupied or the display list is done.
9. Upon completion of the above 8, the printer engine is commanded to start printing.
10. A Hsync interrupt is caused with the Hsync signal from the printer engine, the interrupt routine reads data from the band buffers, and written in the output buffer (FIFO). The hardware causes to send the video data from FIFO to the printer engine.
11. If page protection was set to OFF, the remaining display list is bitmap developed in the band buffer when the data in a band buffer has been completed to send.
12. This is repeated until the entire print area is completed.
13. The display list is cancelled with the eject command from the printer engine.

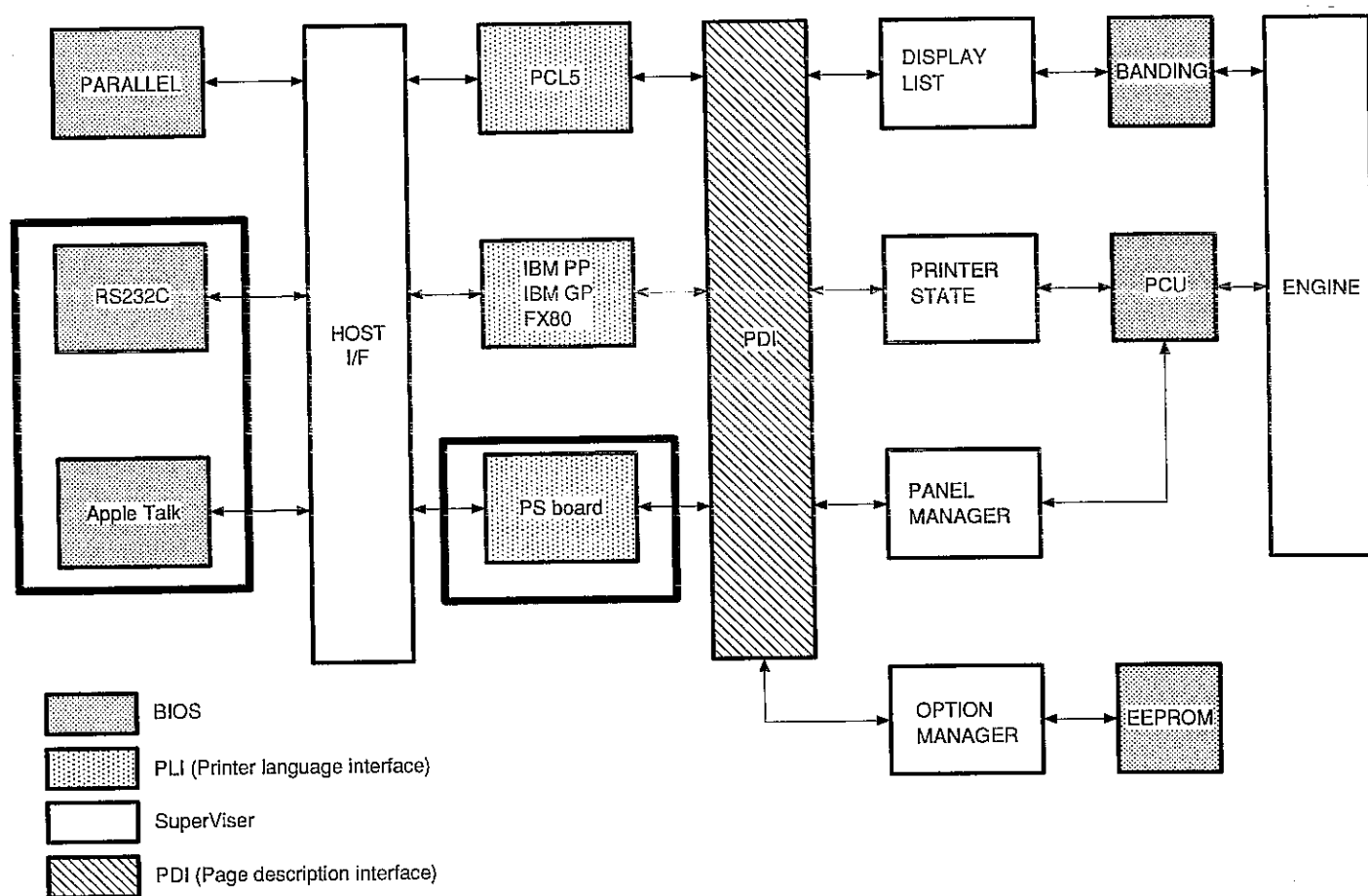


Fig. 13-44

4. Display/keyboard

LCD section: 16 digits, 1 line
5 languages

LED section: Error lamp (Red)
Line lamp (Green)
Data lamp (Orange)
Manual lamp (Orange)

Key section: 8 keys

4-1. Error lamp (Red)

When an error occurs:

ON

When an error is cancelled:

OFF

4-2. Line lamp

On-line: ON

Off-line: OFF

During data reception:

Blink

4-3. Data lamp

There are some print data:

ON

There are no print data:

OFF

There are some print data and there
is an vacancy more than 5 sec in print data forming:

Blink

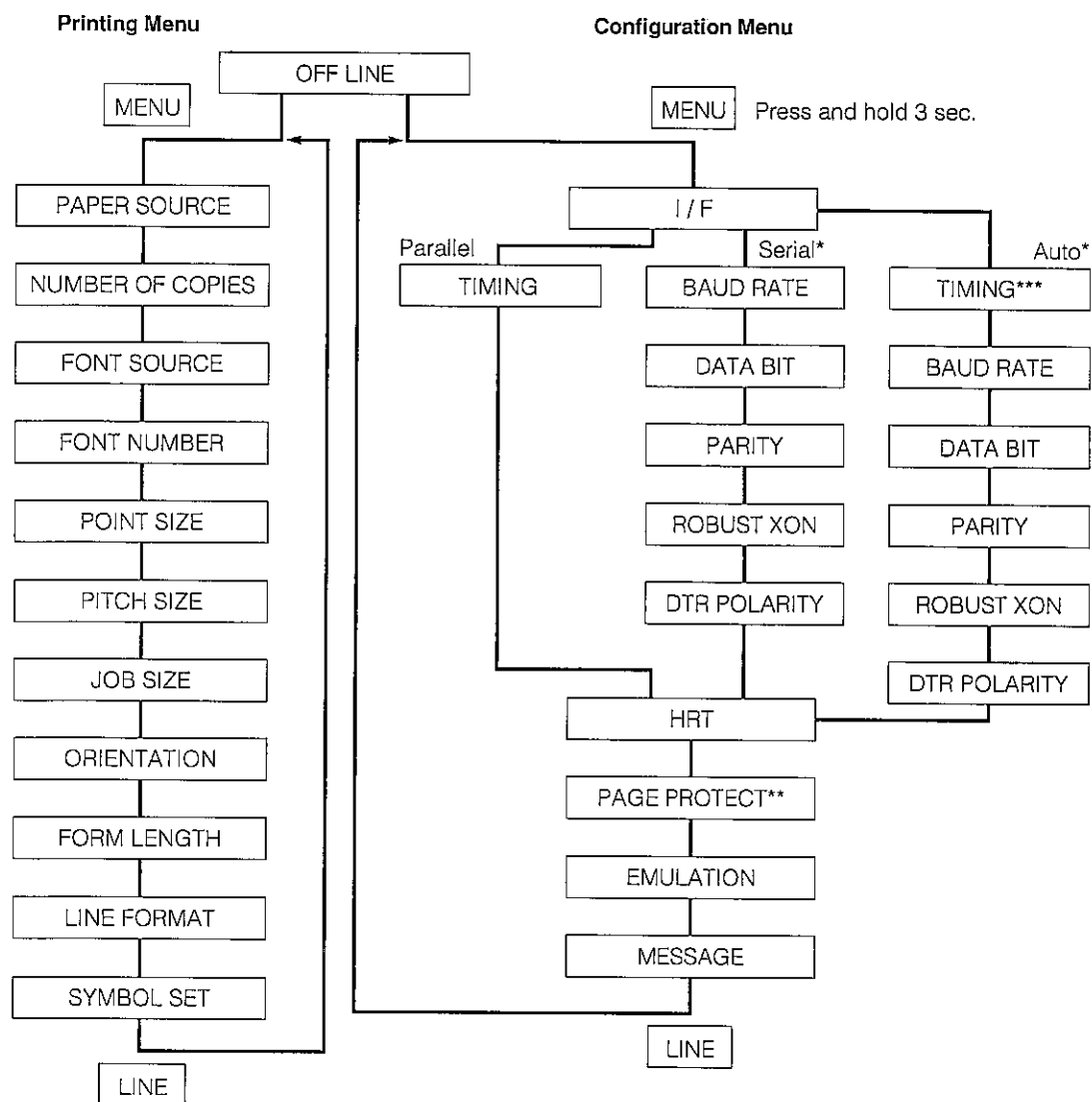
4-4. Manual lamp (Orange)

Manual feed: ON

Cassette feed: OFF

4-5. Key

For the key functions, refer to [2]-1 Key function.

7. MENU SETTING STRUCTURE**7-1. HP LASERJET SERIES III EMULATION**

* Option

** Only when 2 Mbyte memory
is installed at least.

*** Timing for parallel interface

Menu items

MENU

LINE

Press the MENU key or

LINE key to select menu items.

Fig. 13-45

Printing Menu Reference Guide

| Item | Display (Default) | Selectable value |
|------------------|-------------------|---|
| Paper source | TRAY=UPPER | BOTH, UPPER, LOWER, MF ONLY |
| Number of copies | COPIES=1 | 1, 2, ... 99 |
| Font source | FONT SOURCE=I | I (Internal) A (Slot A) B (Slot B) S (Soft font) |
| Font number | FONT NUMBER=0 | 0, 1, ... 99 |
| Point size | PT. SIZE=12.00 | 4.00, ... 999.75 |
| Pitch size | PITCH=10.00 | 0.44, ... 99.99 |
| Job size | JOB SIZE=A4 | LETTER, LEGAL, A4, COM-10, MONARC, DL, C5 |
| Orientation | ORIENTATION=P | P (Portrait) L (Landscape) |
| Form length | FORM LENGTH=64 | 5, 6, ...128 |
| Line format | LINE FORMAT=77 | 77, 80 |
| Symbol set | SYM. SET=ROMAN-8 | See table on List of symbol sets. |

List of Symbol Sets

| Font Printout Symbol Set # | Display | Symbol Set |
|----------------------------|----------|-----------------------|
| 8U | ROMAN-8 | Roman 8 |
| 0N | ECMA-94 | ISO 100 Latin 1 |
| 10U | IBM-US | PC-8 |
| 11U | IBM-D/N | PC-8 Denmark/Norway |
| 12U | PC-850 | PC-850 |
| 1U | LEGAL | Legal |
| 2U | ISO-2 | ISO IRV |
| 1E | ISO-4 | ISO United Kingdom |
| 0U | ISO-6 | ANSI ASCII (USASCII) |
| 3S | ISO-10 | ISO Swedish |
| 0S | ISO-11 | ISO Swedish: names |
| 0K | ISO-14 | JIS ASCII |
| 0I | ISO-15 | ISO Italian |
| 4S | ISO-16 | ISO Portuguese |
| 2S | ISO-17 | ISO Spanish |
| 1G | ISO-21 | ISO German |
| 0F | ISO-25 | ISO French |
| 2K | ISO-57 | ISO Chinese |
| 0D | ISO-60 | ISO Norwegian v1 |
| 1D | ISO-61 | ISO Norwegian v2 |
| 1F | ISO-69 | ISO French |
| 5S | ISO-84 | ISO Portuguese: IBM |
| 6S | ISO-85 | ISO Spanish: IBM |
| 0G | GERMAN | HP German |
| 1S | SPANISH | HP Spanish |
| 6M | VN MATH | Ventura Math |
| 13J | VN INTL | Ventura International |
| 14J | VN US | Ventura US |
| 5M | PS MATH | PS Math |
| 10J | PS TEXT | PS Text |
| 8M | MATH-8 | Math-8 |
| 15U | PI FONT | Pi Font |
| 6J | MS PUBL | Microsoft Publishing |
| 9U | WINDOWS | Windows |
| 7J | DESK TOP | Desk Top |

Configuration Menu Reference Guide

| Item | Display (Default) | Selectable Value |
|-----------------|-------------------|--|
| Interface | I/F=PARALLEL | PARALLEL, SERIAL*, AUTO* |
| Timing | TIMING=1 | 1, 2, 3 |
| Baud rate* | BAUD RATE=9600 | 300, 600, 1200, 2400, 4800, 9600, 19200 |
| Data bit* | DATA BIT=8 | 8, 7 |
| Parity* | PARITY=NON | NON, EVN, ODD |
| Robust XON* | ROBUST XON=ON | ON, OFF |
| DTR polarity* | DTR POLARITY=HI | HI (High), LO (Low) |
| HRT | HRT=ON | ON, OFF |
| Page protection | PAGEPROTECT=OFF | OFF, LE, LL, A4 |
| Emulation | EMULATION=HPLJ3 | HPLJ3, FX80, IBMGP, IBMPP, D630, HEX, PS*, AUTO* |
| Language | MESSAGE=ENGLISH | ENGLISH, FRENCH, GERMAN, ITALIAN, SPANISH |

* Display with option

7-2. PS board EMULATION

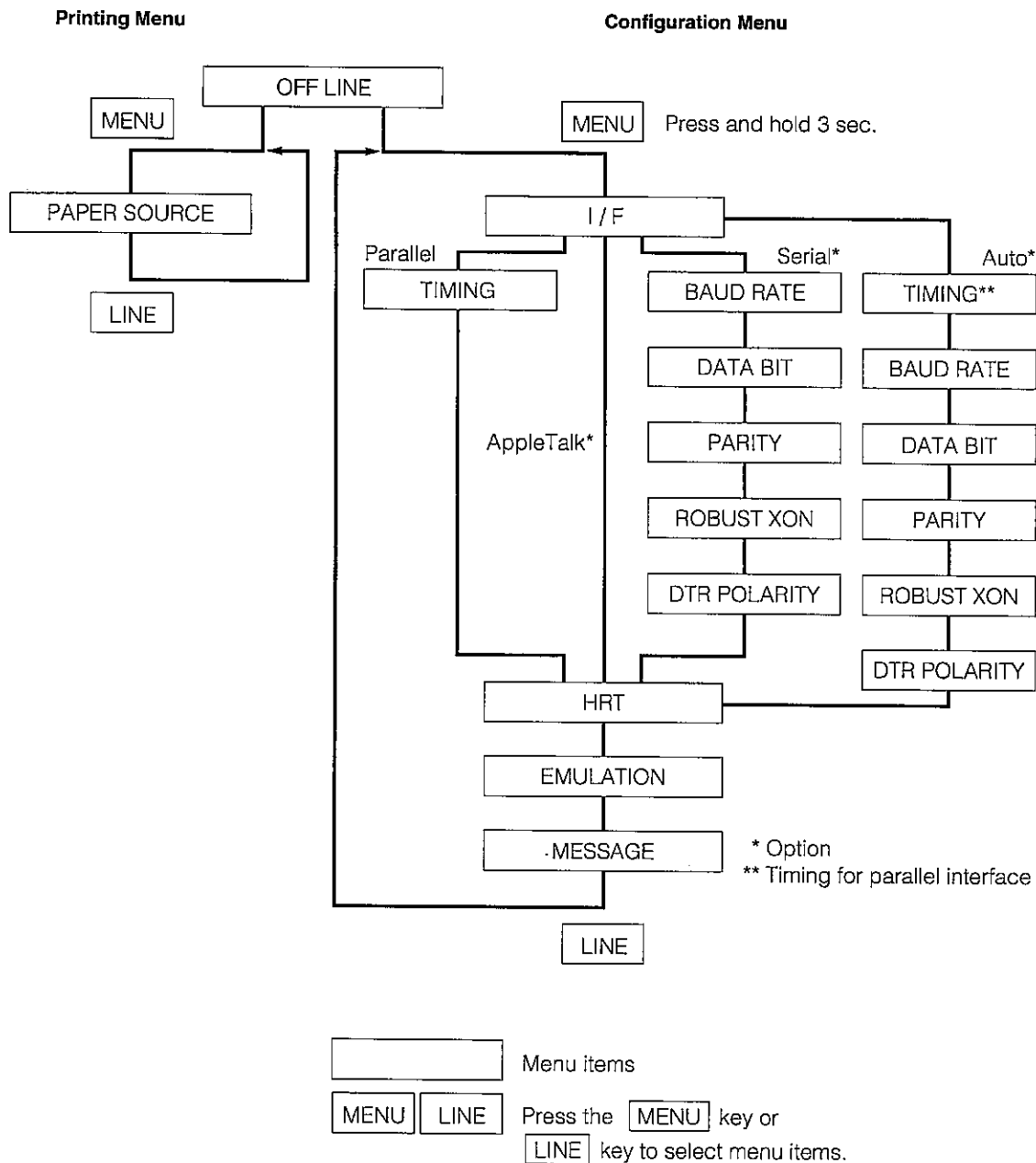


Fig. 13-46

Printing Menu Reference Guide

| Item | Display (Default) | Selectable Value |
|--------------|-------------------|-----------------------------|
| Paper source | TRAY=UPPER | BOTH, UPPER, LOWER, MF ONLY |

Configuration Menu Reference Guide

| Item | Display (Default) | Selectable Value |
|---------------|-------------------|---|
| Interface | I/F=PARALLEL | PARALLEL, SERIAL* APPLE TALK*, AUTO* |
| Timing | TIMING=1 | 1, 2, 3 |
| Baud rate* | BAUD RATE=9600 | 300, 600, 1200, 2400, 4800, 9600, 19200 |
| Data bit* | DATA BIT=8 | 8, 7 |
| Parity* | PARITY=NON | NON, EVN, ODD |
| Robust XON* | ROBUST XON=ON | ON, OFF |
| DTR Polarity* | DTR POLARITY=HI | HI (High), LO (Low) |
| HRT | HRT=ON | ON, OFF |
| Emulation | EMULATION=PS | HPLJ3, FX80, IBMPP, D630, HEX, PS*, AUTO* |
| Message | MESSAGE=ENGLISH | ENGLISH, FRENCH, GERMAN, ITALIAN, SPANISH |

* Option

7-3. Epson FX-80

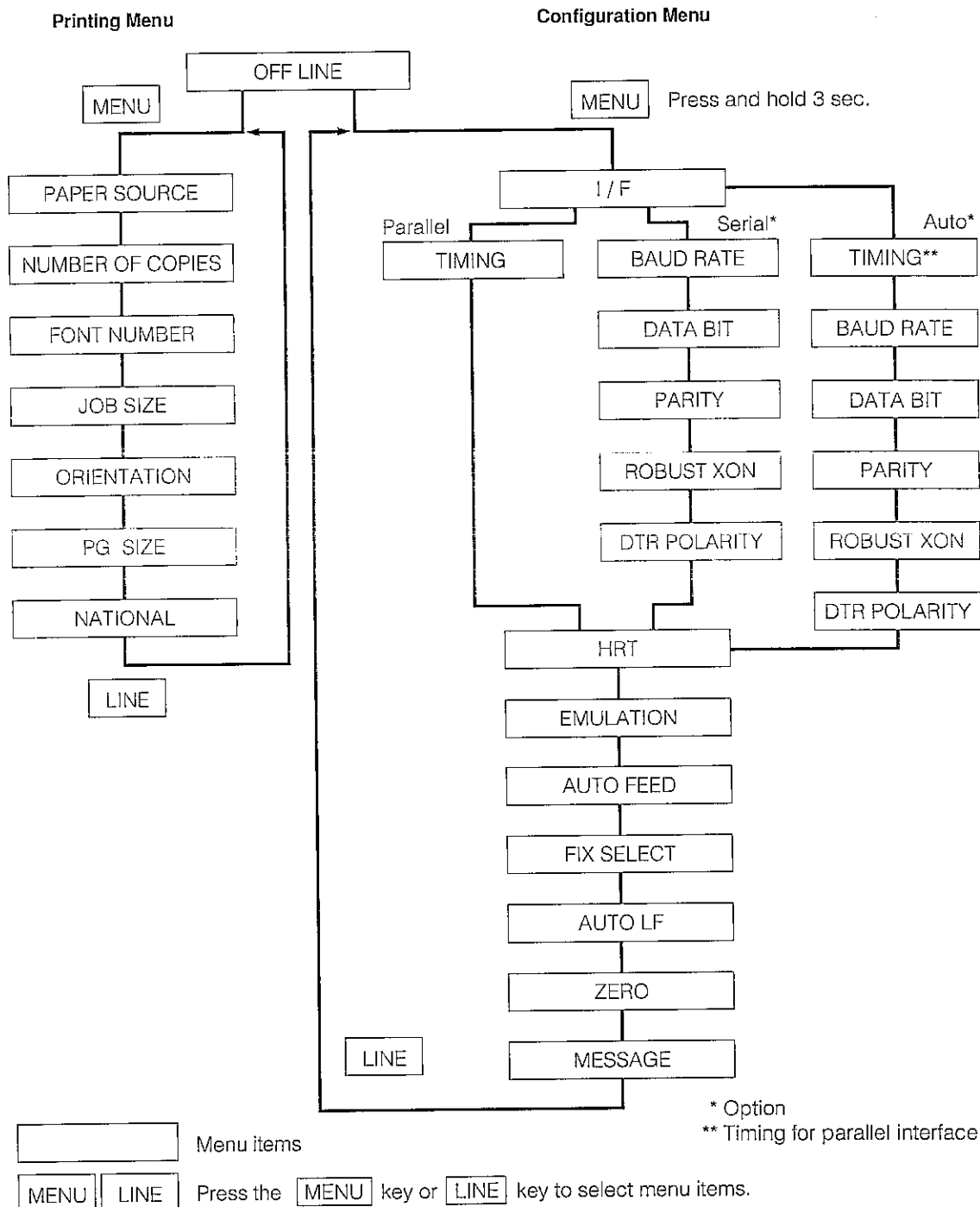


Fig. 13-47

Printing Menu Items

| Item | Display (Default) | Selectable Value |
|--------------------|-------------------|---|
| Paper source | TRAY=UPPER | BOTH, UPPER, LOWER, MF ONLY |
| Number of copies | COPIES=1 | 1, 2, ... 99 |
| Font number | FONT NUMBER=0 | 0 (COURIER) 1 (CONDENSE) 2 (EMPHASIZE) 3 (CONDENSE EMPHASIZE) |
| Job size | JOB SIZE=A4 | LETTER, LEGAL, A4, COM-10, MONARC, DL, C5 |
| Orientation | ORIENTATION=P | P (Portrait) L (Landscape) |
| Page size | PG SIZE=NORMAL | NORMAL, EXTEND |
| National character | NATIONAL=U.S.A. | U.S.A., FRANCE, GERMNY, ENGLND, DNMRK1, SWEDEN, ITALY, SPAIN, JAPAN, NORWAY, DNMRK2 |

Configuration Menu Items

| Item | Display (Default) | Selectable Value |
|----------------|-------------------|--|
| Interface | I/F=PARALLEL | PARALLEL, SERIAL*, AUTO* |
| Timing | TIMING=1 | 1, 2, 3 |
| Baud rate* | BAUD RATE=9600 | 300, 600, 1200, 2400, 4800, 9600, 19200 |
| Data bit* | DATA BIT=8 | 8, 7 |
| Parity* | PARITY=NON | NON, EVN, ODD |
| Robust XON* | ROBUST XON=ON | ON, OFF |
| DTR polarity* | DTR POLARITY=HI | HI (High), LO (Low) |
| HRT | HRT=ON | ON, OFF |
| Emulation | EMULATION=FX80 | HPLJ3, FX80, IBMGP, IBMPP, D630, HEX, PS*, AUTO* |
| Auto feed | AUTO FEED=OFF | OFF, ON |
| Fixed select | FIX SELECT=ON | OFF, ON |
| Auto line feed | AUTO LF=OFF | OFF (CR=CR) ON (CR=CR+LF) |
| Zero character | ZERO=0 | 0, Ø |
| Language | MESSAGE=ENGLISH | ENGLISH, FRENCH, GERMAN, ITALIAN, SPANISH |

* Option

7-4. IBM Proprinter/Graphics Printer

Printing Menu

Configuration Menu

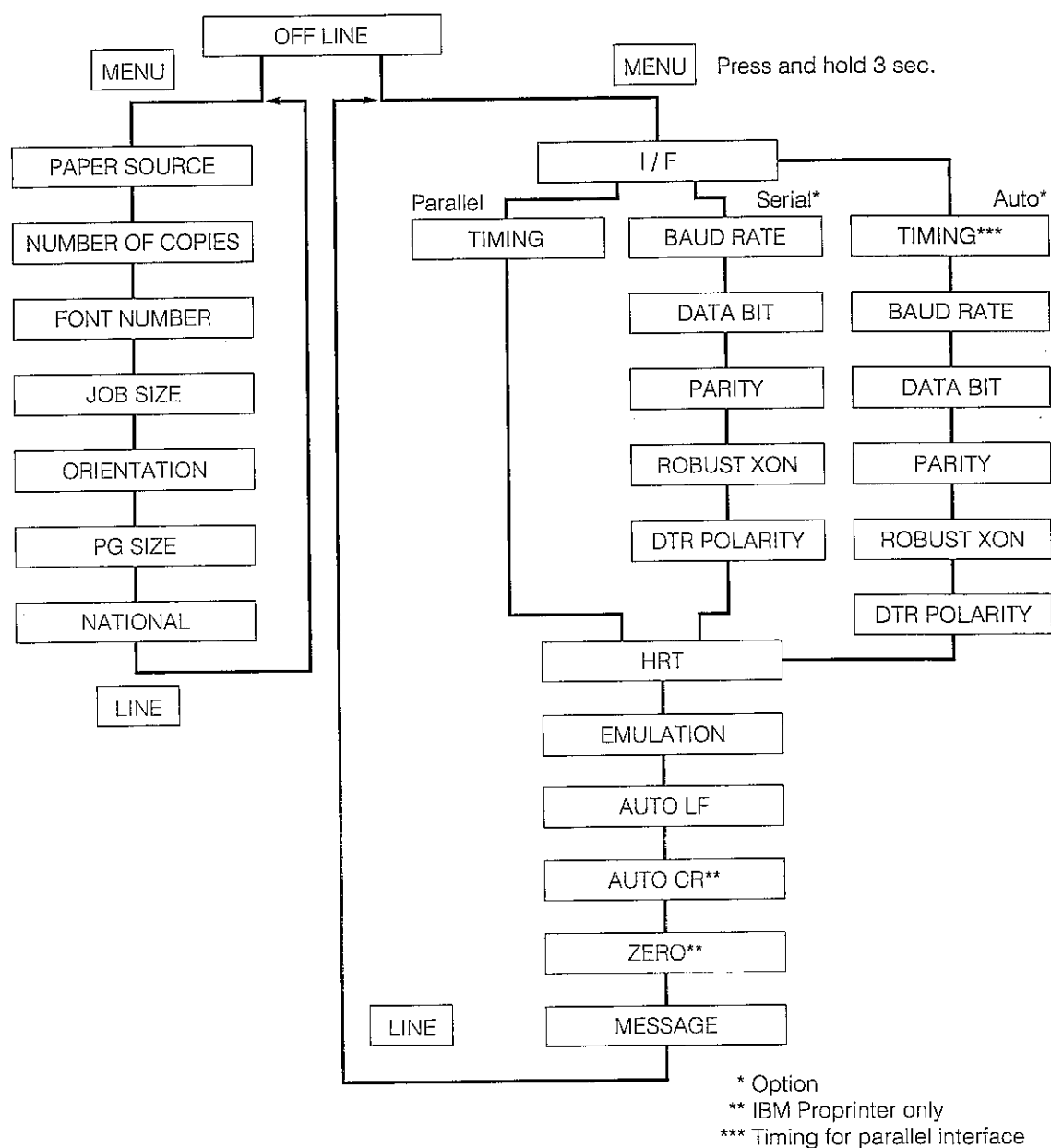


Fig. 13-48

Printing Menu Items

| Item | Display (Default) | Selectable Value |
|--------------------|-------------------|--|
| Paper source | TRAY=UPPER | BOTH, UPPER, LOWER, MF ONLY |
| Number of copies | COPIES=1 | 1, 2, ... 99 |
| Font number | FONT NUMBER=0 | 0 (CHARACTER SET 1) 1 (CHARACTER SET 2) |
| Job size | JOB SIZE=A4 | LETTER, LEGAL, A4, COM-10, MONARC, DL, C5 |
| Orientation | ORIENTATION=P | P (Portrait) L (Landscape) |
| Page size | PG SIZE=NORMAL | NORMAL, EXTEND |
| National character | NATIONAL=GLOBAL | GLOBAL (International) D/N (Denmark/Norway) |

Configuration Menu Items

| Item | Printer Display (Default) | Selectable Value |
|------------------------|---------------------------|--|
| Interface | I/F=PARALLEL | PARALLEL, SERIAL*, AUTO* |
| Timing | TIMING=1 | 1, 2, 3 |
| Baud rate* | BAUD RATE=9600 | 300, 600, 1200, 2400, 4800, 9600, 19200 |
| Data bit* | DATA BIT=8 | 8, 7 |
| Parity* | PARITY=NON | NON, EVN, ODD |
| Robust XON* | ROBUST XON=ON | ON, OFF |
| DTR polarity* | DTR POLARITY=HI | HI (High), LO (Low) |
| HRT | HRT=ON | ON, OFF |
| Emulation | EMULATION=IBMPP | HPLJ3, FX80, IBMGP, IBMPP, D630, HEX, PS*, AUTO* |
| Auto line feed | AUTO LF=OFF | OFF (CR=CR) ON (CR=CR+LF) |
| Auto carriage return** | AUTO CR=OFF | OFF LF=LF VT=VT ESCJ=ESCJ ON LF=LF+CR VT=VT+CR ESCJ=ESCJ+CR |
| Zero character** | ZERO=0 | 0, Ø |
| Language | MESSAGE=ENGLISH | ENGLISH, FRENCH, GERMAN, ITALIAN, SPANISH |

* Option

** IBM Proprinter only

7-5. Automatic Emulation Switching Function

This function can be used only when the PostScript board is installed and Emulation is set to AUTO. For setting this function, at least 3Mbyte memory is required. 1Mbyte memory is already included in the printer as a standard feature.

NOTE: • Automatic emulation switching function is not applied to the other four emulations (Epson FX-80, IBM Graphics Printer, and IBM Proprinter).

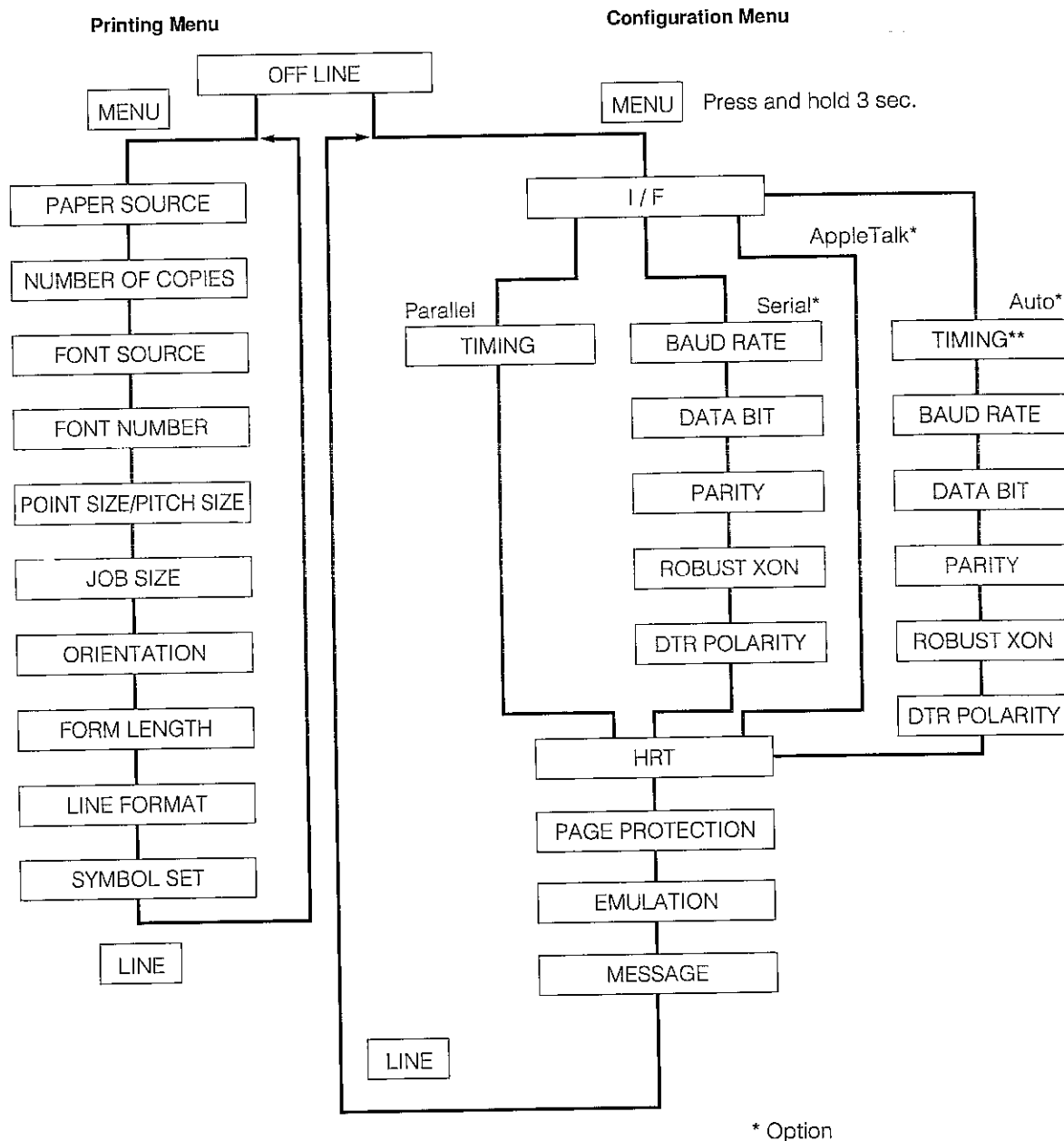
- When you use automatic emulation switching, the memory is allocated to each emulation. One emulation, therefore, cannot use full memory. To use full memory from one emulation, set Emulation to the desired emulation (for example, HPLJ3).

Avialbe User memory

(M: Mbyte, K: Kbyte)

| Memory capacity | HP LJ3 emulation | | Automatic emulation | |
|-----------------|---------------------|-----------------------|---------------------|-----------------------|
| | Page Protection off | Page Protection LE/A4 | Page Protection off | Page Protection LE/A4 |
| 1M | 500K | X | X | X |
| 2M | 1500K | 400K | X | X |
| 3M | 2500K | 1400K | 500K | 500K |
| 4M | 3500K | 2400K | 1000K | 1000K |
| 5M | 4500K | 3500K | 1100K | 1100K |
| 6M | 5500K | 4500K | 1500K | 1500K |
| 7M | 6500K | 5500K | 2000K | 2000K |
| 9M | 8500K | 7500K | 3900K | 3900K |

(X: unusable)



* Option

Menu items

Press the **MENU** key or **LINE** key to select menu items.

Fig. 13-50

Printing Menu Reference Guide

| Item | Display (Default) | Selectable value |
|------------------|-------------------|---|
| Paper source | TRAY=UPPER | BOTH, UPPER, LOWER, MF ONLY |
| Number of copies | COPIES=1 | 1, 2, ... 99 |
| Font source | FONT SOURCE=I | I (Internal) A (Slot A) B (Slot B) S (Soft font) |
| Font number | FONT NUMBER=0 | 0, 1, ... 99 |
| Point size | PT. SIZE=12.00 | 4.00, ... 999.75 |
| Pitch size | PITCH=10.00 | 0.44, ... 99.99 |
| Job size | JOB SIZE=A4 | LETTER, LEGAL, A4, COM-10, MONARC, DL, C5 |
| Orientation | ORIENTATION=P | P (Portrait) L (Landscape) |
| Form length | FORM LENGTH=64 | 5, 6, ...128 |
| Line format | LINE FORMAT=77 | 77, 80 |
| Symbol set | SYM. SET=ROMAN-8 | See table on List of symbol sets. |

List of Symbol Sets

| Font Printout Symbol Set # | Display | Symbol Set |
|----------------------------|----------|-----------------------|
| 8U | ROMAN-8 | Roman 8 |
| 0N | ECMA-94 | ISO 100 Latin 1 |
| 10U | IBM-US | PC-8 |
| 11U | IBM-D/N | PC-8 Denmark/Norway |
| 12U | PC-850 | PC-850 |
| 1U | LEGAL | Legal |
| 2U | ISO-2 | ISO IRV |
| 1E | ISO-4 | ISO United Kingdom |
| 0U | ISO-6 | ANSI ASCII (USASCII) |
| 3S | ISO-10 | ISO Swedish |
| 0S | ISO-11 | ISO Swedish: names |
| 0K | ISO-14 | JIS ASCII |
| 0I | ISO-15 | ISO Italian |
| 4S | ISO-16 | ISO Portuguese |
| 2S | ISO-17 | ISO Spanish |
| 1G | ISO-21 | ISO German |
| 0F | ISO-25 | ISO French |
| 2K | ISO-57 | ISO Chinese |
| 0D | ISO-60 | ISO Norwegian v1 |
| 1D | ISO-61 | ISO Norwegian v2 |
| 1F | ISO-69 | ISO French |
| 5S | ISO-84 | ISO Portuguese: IBM |
| 6S | ISO-85 | ISO Spanish: IBM |
| 0G | GERMAN | HP German |
| 1S | SPANISH | HP Spanish |
| 6M | VN MATH | Ventura Math |
| 13J | VN INTL | Ventura International |
| 14J | VN US | Ventura US |
| 5M | PS MATH | PS Math |
| 10J | PS TEXT | PS Text |
| 8M | MATH-8 | Math-8 |
| 15U | PI FONT | Pi Font |
| 6J | MS PUBL | Microsoft Publishing |
| 9U | WINDOWS | Windows |
| 7J | DESK TOP | Desk Top |

7-6. HEX Dump mode

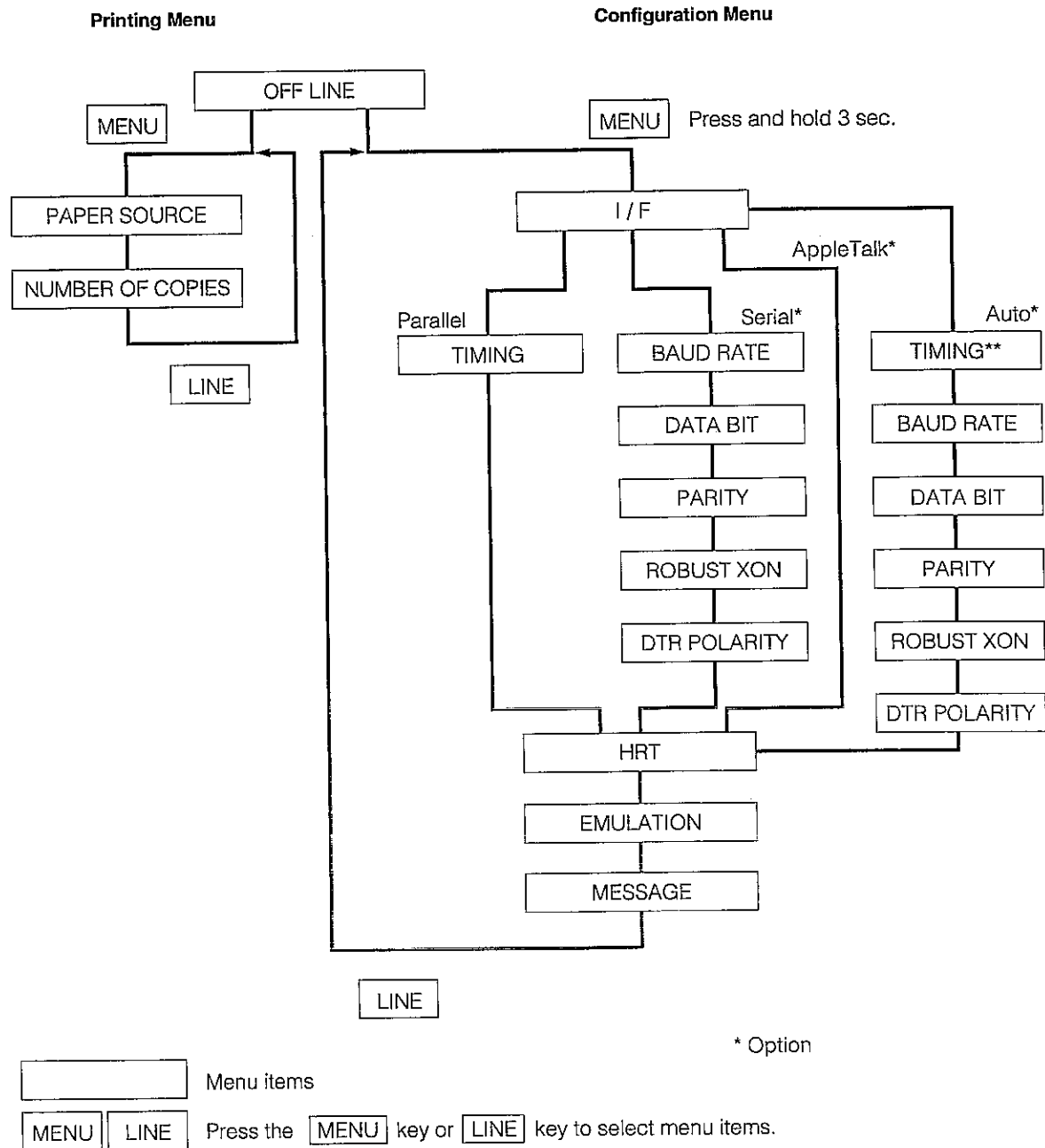


Fig. 13-51

Printing Menu Lists

| Item | Printer Display | Selectable Value |
|------------------|-----------------|-----------------------------|
| Paper source | TRAY = UPPER | BOTH, UPPER, LOWER, MF ONLY |
| Number of copies | COPIES = 1 | 1, 2, ... 99 |

Configuration Menu Items

| Item | Printer Display (Default) | Selectable Value |
|---------------|---------------------------|--|
| Interface | I/F=PARALLEL | SERIAL*, AUTO*, APPLTALK* |
| Timing | TIMING=1 | 1, 2, 3 |
| Baud rate* | BAUD RATE=9600 | 300, 600, 1200, 2400, 4800, 9600, 19200 |
| Data bit* | DATA BIT=8 | 8, 7 |
| Parity* | PARITY=NON | NON, EVN, ODD |
| Robust XON* | ROBUST XON=ON | ON, OFF |
| DTR polarity* | DTR POLARITY=HI | HI (High), LO (Low) |
| HRT | HRT=ON | ON, OFF |
| Emulation | EMULATION=D630 | HPLJ3, FX80, IBMGP, IBMPP, D630, HEX, PS*, AUTO* |
| Language | MESSAGE=ENGLISH | ENGLISH, FRENCH, GERMAN, ITALIAN, SPANISH |

* Option

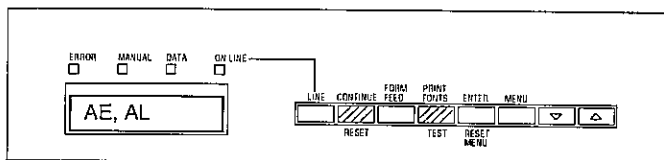
8. EEPROM initializing

While pressing the keys indicated with shadow, supply the power to display the message, then initializing can be made.

Procedure to initialize

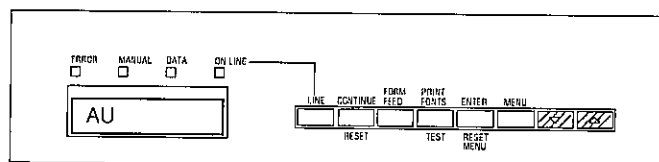
- ① Cut off the printer power.
- ② Pressing the keys, supply the printer power.
- ③ Keep pressing the keys until the message is displayed.
- ④ Cut off the printer power.

Canada and 100V series except USA



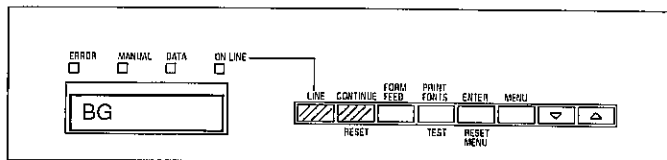
A4 = 77/80 selectable
JOB SIZE = LETTER
IBM CHR = SET 1
I/F = Parallel

USA



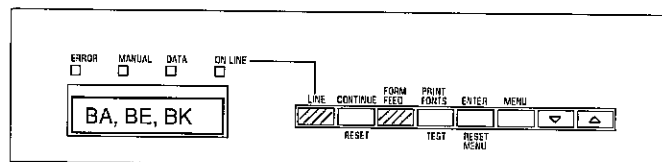
A4 = 77 CHR.
JOB SIZE = LETTER
IBM CHR = SET 1
I/F = Parallel

Europe



A4 = 77/80 selectable
JOB SIZE = A4
IBM CHR = SET 2
I/F = Parallel

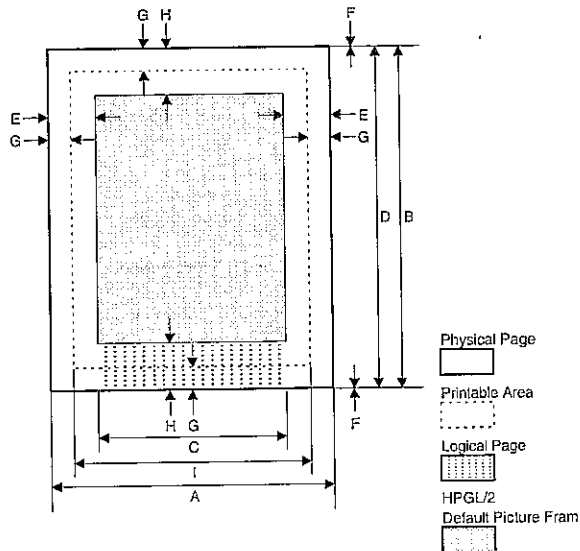
U.K., Australia and 200V series except Europe



A4 = 77/80 selectable
JOB SIZE = A4
IBM CHR = SET 1
I/F = Parallel

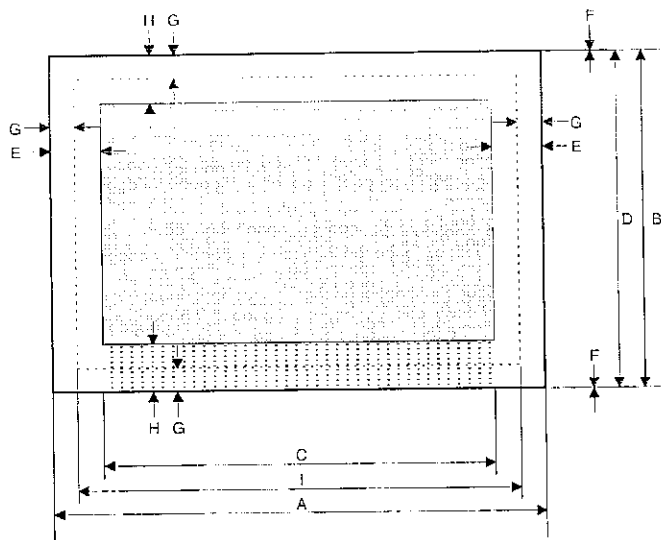
Fig. 13-52

9. Printable area



| PAPER SIZE | A | B | C | D | E | F | G | H | I |
|------------|------|------|------|------|----|---|----|-----|------|
| LETTER | 2550 | 3300 | 2400 | 3300 | 75 | 0 | 50 | 150 | 2450 |
| LEGAL | 2550 | 4200 | 2400 | 4200 | 75 | 0 | 50 | 150 | 2450 |
| A4 (77) | 2480 | 3507 | 2338 | 3507 | 71 | 0 | 50 | 150 | 2380 |
| A4 (80) | 2480 | 3507 | 2440 | 3507 | 71 | 0 | 50 | 150 | 2400 |
| COM-10 | 1237 | 2850 | 1087 | 2850 | 75 | 0 | 50 | 150 | 1137 |
| MONARC | 1162 | 2250 | 1012 | 2250 | 75 | 0 | 50 | 150 | 1062 |
| C5 | 1913 | 2704 | 1771 | 2704 | 71 | 0 | 50 | 150 | 1813 |
| DL | 1299 | 2598 | 1157 | 2598 | 71 | 0 | 50 | 150 | 1199 |

Fig. 13-53



| PAPER SIZE | A | B | C | D | E | F | G | H | I |
|------------|------|------|------|------|----|---|----|-----|------|
| LETTER | 3300 | 2550 | 3180 | 2550 | 60 | 0 | 50 | 150 | 3200 |
| LEGAL | 4200 | 2550 | 4080 | 2550 | 60 | 0 | 50 | 150 | 4100 |
| A4 | 3507 | 2480 | 3389 | 2480 | 59 | 0 | 50 | 150 | 3407 |
| COM-10 | 2850 | 1237 | 2730 | 1237 | 60 | 0 | 50 | 150 | 2750 |
| MONARC | 2250 | 1162 | 2130 | 1162 | 60 | 0 | 50 | 150 | 2150 |
| C5 | 2704 | 1913 | 2586 | 1913 | 59 | 0 | 50 | 150 | 2604 |
| DL | 2598 | 1299 | 2480 | 1299 | 59 | 0 | 50 | 150 | 2498 |

Fig. 13-54

9-1. Paper

This controller supports 7 sizes of paper, as follows:

1. LETTER
2. LEGAL
3. A4
4. COMMERCIAL 10
5. MONARCH
6. INTERNATIONAL C5
7. INTERNATIONAL DL

The printable areas in relation to paper size are illustrated in Charts 1-1 and 1-2.

9-2. Note:

9-2-1. A4 Size

Horizontal Printable Area for A4 size paper in HP emulation Portrait can be switched from 2338 dots (77 character) to 2400 dots (80 character) through the KEY.

However, vertical printable area and Landscape mode is the same as HP, and therefore printable area cannot be adjusted.

9-2-3. How to handle character outside printable area.

Characters extending beyond the printable area have to be clipped through a software program.

This controller does not have a clipping function for extensions beyond the printable area.

10. I/F

10-1. Centronics I/F (Standard)

A. When POWER ON (Chart. 1)

First, initialization of the port is completed (OFF LINE state).

Next, internal initialization is completed and data may be inputted (ON LINE).

Then, in timings 1 ~ 3, ACK, BUSY are outputted.

B. When receiving data (Chart. 2)

Parallel interrupt occurs when DATA and STB signals are sent from the host.

Data is gathered and written into the buffer.

Then, BUSY, ACK signals are outputted in the timing 1 ~ 3.

C. BUSY state

In the below situations, the interface is in a busy state.

1. When turned OFF LINE through the keys.
2. When an error occurs. (Fig. 3)

| Condition | Signal | Emulation | | | | | | |
|----------------------|--------|-----------|------|-------|-------|------|-----|----|
| | | HP | FX80 | IBMGP | IBMPP | D630 | HEX | PS |
| ON LINE | SELECT | H | H | H | H | H | H | H |
| | BUSY | L | L | L | L | L | L | L |
| | FAULT | H | H | H | H | H | H | H |
| | PE | L | L | L | L | L | L | L |
| OFF LINE (KEY) | SELECT | L | H | L | L | H | L | L |
| | BUSY | H | H | H | H | H | H | H |
| | FAULT | L | L | L | H | H | L | L |
| | PE | L | L | L | L | L | L | L |
| ERROR (OP. CALL) | SELECT | L | H | L | L | H | L | L |
| | BUSY | H | H | H | H | H | H | H |
| | FAULT | L | L | L | L | L | L | L |
| | PE | L | L | L | L | L | L | L |
| ERROR (PAPER OUT) | SELECT | L | H | L | L | H | L | L |
| | BUSY | H | H | H | H | H | H | H |
| | FAULT | L | L | L | L | L | L | L |
| | PE | H | H | H | H | H | H | H |
| ERROR (MACHINE DOWN) | SELECT | L | H | L | L | H | L | L |
| | BUSY | H | H | H | H | H | H | H |
| | FAULT | L | L | L | L | L | L | L |
| | PE | L | L | L | L | L | L | L |

L = Low level

H = High level

Centronics I/F Signal

Xoff (DC3; 13Hex)

In the following conditions, an XOFF CODE is sent to the host.

1. When turned OFF LINE through KEYS.
2. When an error occurs.
3. When the empty area in the receiving buffer is 450 Bytes.

NOTE: When ROBUST-XON is ON

1. When turned ON LINE through the KEY.
2. When an error is released.
3. When the DATA inside the receiving buffer is 4KBytes or under.

In the above situations, an XON CODE is sent to the host every second.

C-2. DTR protocol

DTRon In the following circumstances, DTR is to be LOW (when DTR polarity is HI)
(When DTR polarity is LO, DTR is HIGH.)

1. When turned ON LINE through the KEY.
2. When an error is released.
3. When the DATA inside the receiving buffer is 4K-Bytes or under.

DTRoff In the following circumstances, DTR is HIGH (when DTR polarity is HI)
(When DTR polarity is LOW, DTR is LOW.)

1. When turned OFF LINE through KEYS.
2. When an error occurs.
3. When the empty area in the receiving buffer is 450 Bytes.

3. When the empty area in the receiving buffer is 450 Bytes.

D. Release of BUSY state

In the following situations; the busy state of the interface can be released.

1. When turned ON LINE through the KEY.
2. When an error is released.
3. When the DATA inside the receiving buffer is 4KBytes or under.

10-2. RS232C (Option)**A. DATA FORMAT**

DATA format is 1start bit

7 or 8 Data bit (Changeable through KEYS)

1 stop bit

NON/EVEN/ODD parity (Changeable through KEYS).

B. BUAD RATE

Supports 300, 600, 1200, 2400, 4800, 9600, 19200

C. Protocol

RS-232C I/F supports the following protocol.

1. XON/XOFF protocol
2. DTR protocol

C-1. XON/XOFF protocol

Xon (DC1; 11Hex)

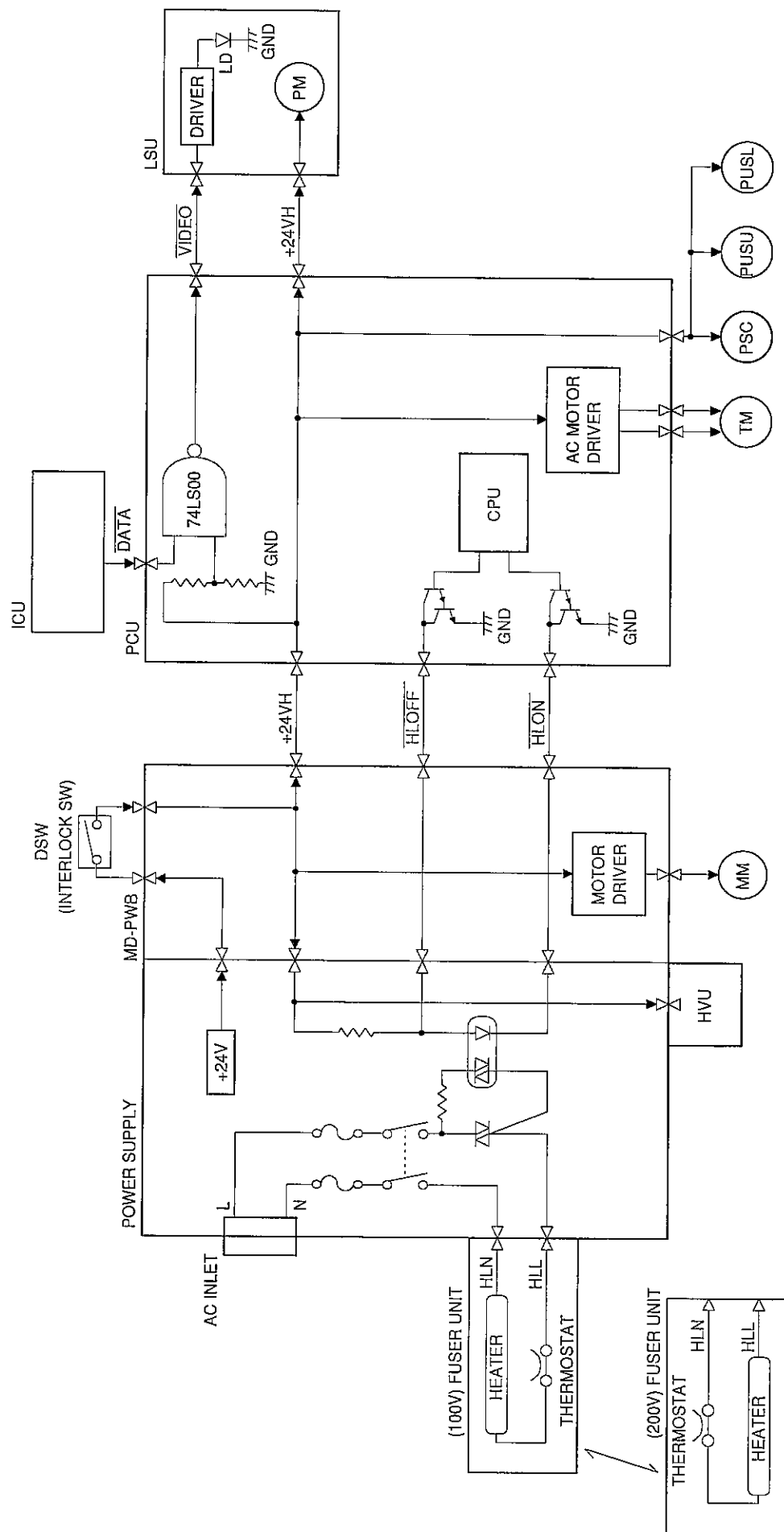
In the following conditions, an XON CODE is sent to the host.

1. When turned ON LINE through the KEY.
2. When an error is released.
3. When the DATA inside the receiving buffer is 4KBytes or under.

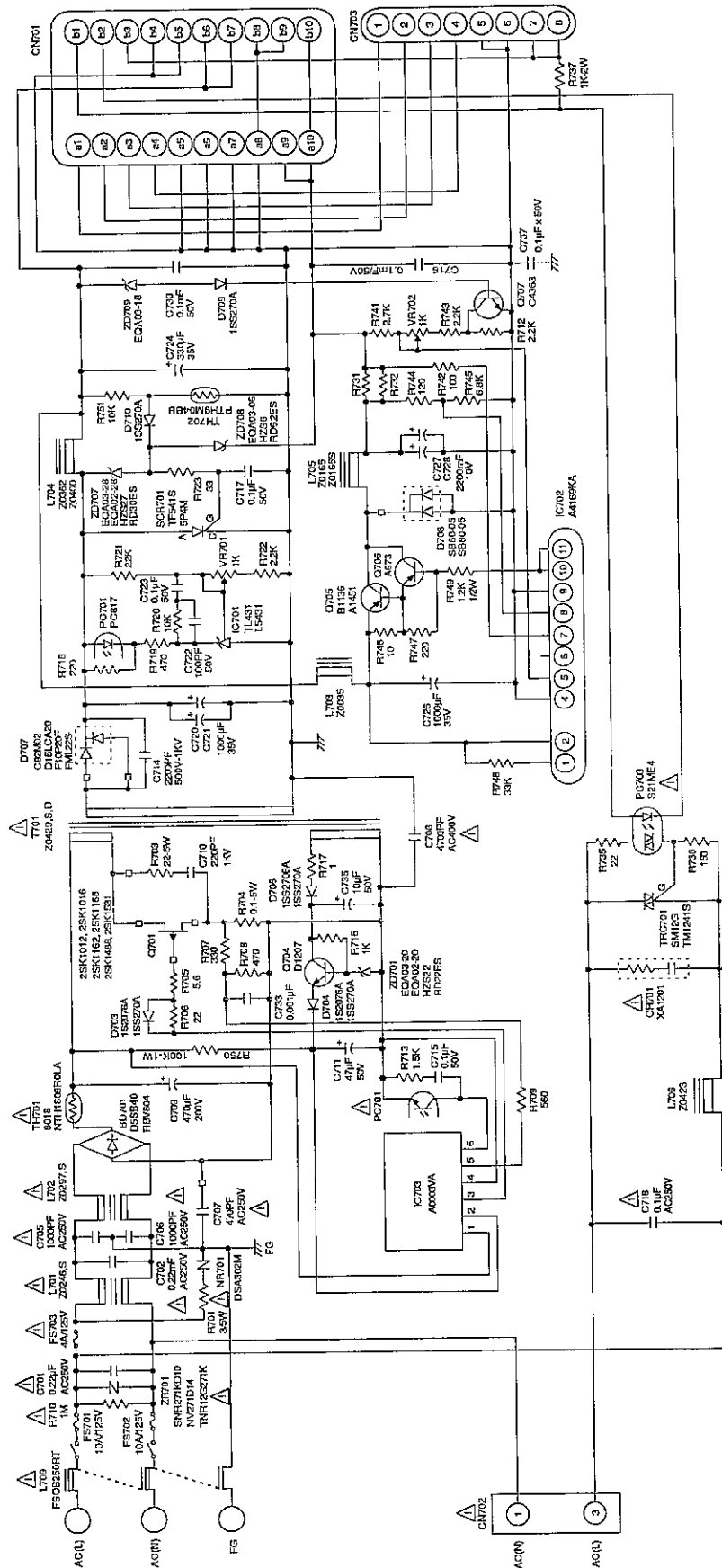
[14] CIRCUIT DIAGRAM

| | |
|---|-----|
| 1. INTERLOCK CIRCUIT | 111 |
| 2. POWER SUPPLY CIRCUIT (100V SERIES) | 112 |
| POWER SUPPLY P.W.B (100V SERIES) | 113 |
| POWER SUPPLY CIRCUIT (200V SERIES) | 114 |
| POWER SUPPLY P.W.B (200V SIERES) | 115 |
| 3. PCU CIRCUIT | 116 |
| PCU P.W.B | 117 |
| 4. OPERATION CIRCUIT | 118 |
| OPERATION P.W.B | 119 |
| 5. CASSETTE SWITCH (CS) CIRCUIT | 120 |
| CASSETTE SWITCH (CS) P.W.B | 121 |
| 6. MOTOR DRIVE (MD) CIRCUIT | 122 |
| MOTOR DRIVE (MD) P.W.B | 123 |
| 7. ICU CIRCUIT | 124 |
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| 8. WIRING DIAGRAM | 134 |
| 9. CONNECTOR SIGNAL NAME | 135 |
| 10. P.S CIRCUIT | 137 |
| P.S P.W.B | 138 |
| 11. EXPANSION MEMORY CIRCUIT | 139 |
| EXPANSION MEMORY P.W.B | 140 |
| 12. APPLE TALK/RS232C I/F CIRCUIT | 141 |
| APPLE TALK/RS232C I/F P.W.B | 142 |
| 13. SIGNAL LIST | 143 |

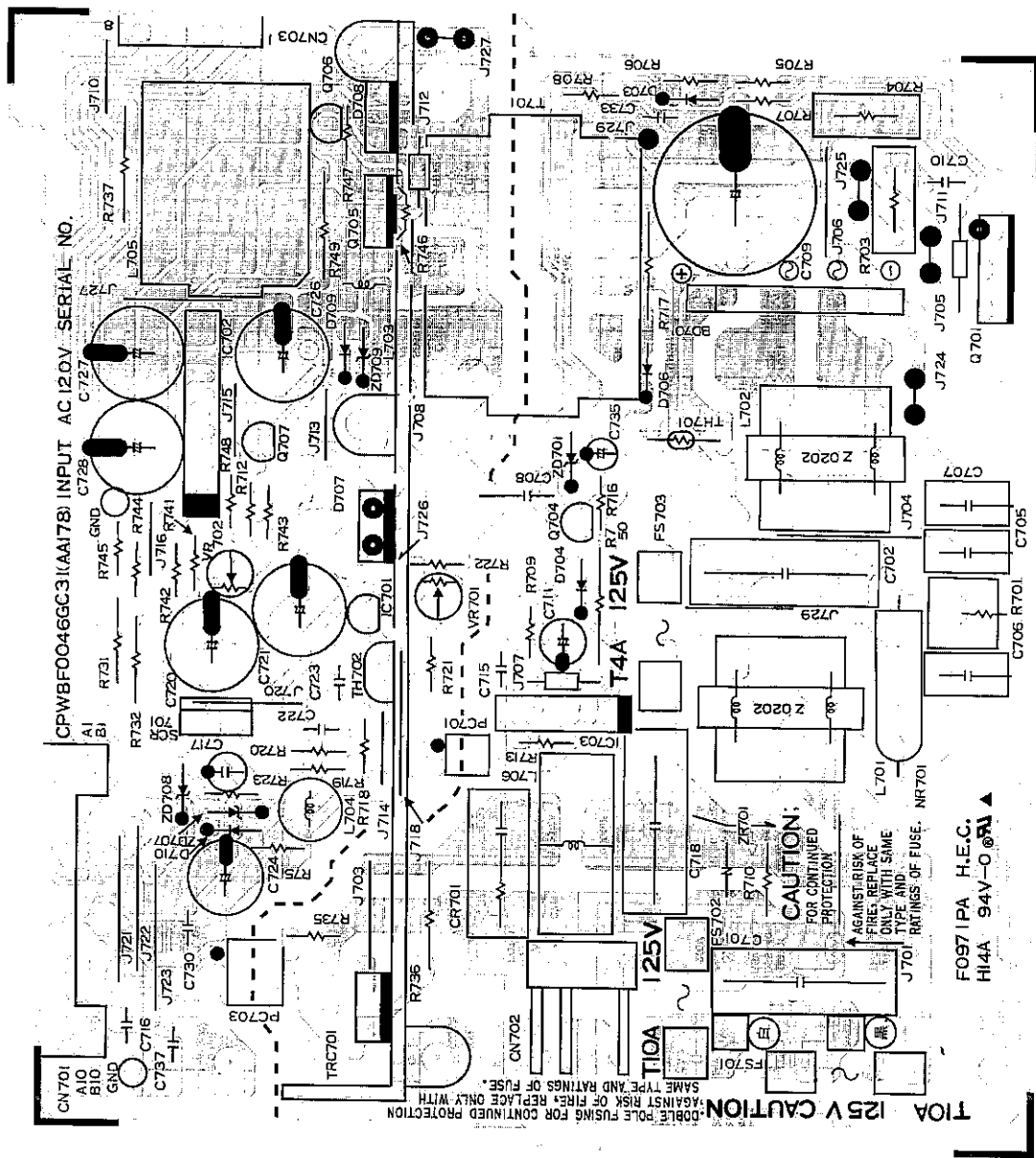
1. INTERLOCK CIRCUIT



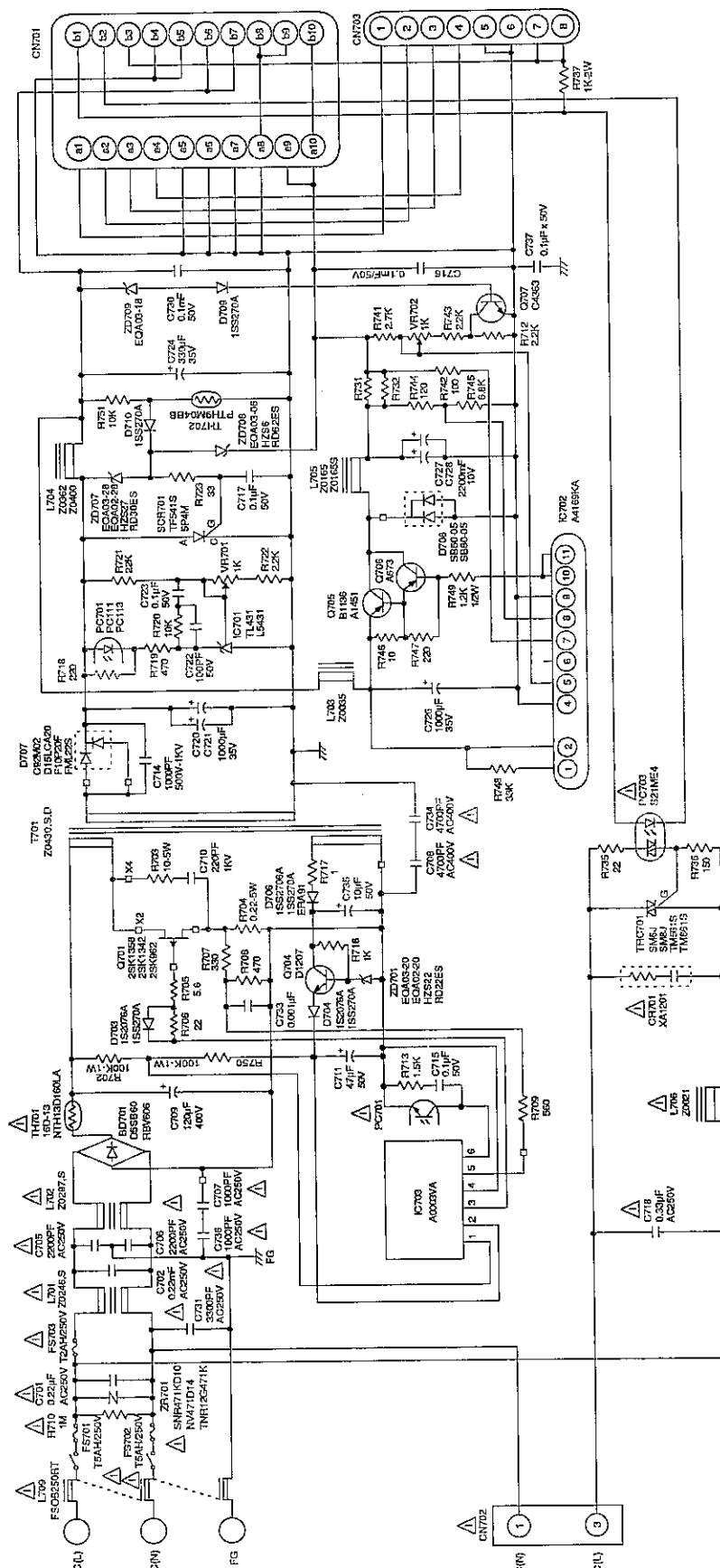
2-1. POWER SUPPLY CIRCUIT (100V SERIES)



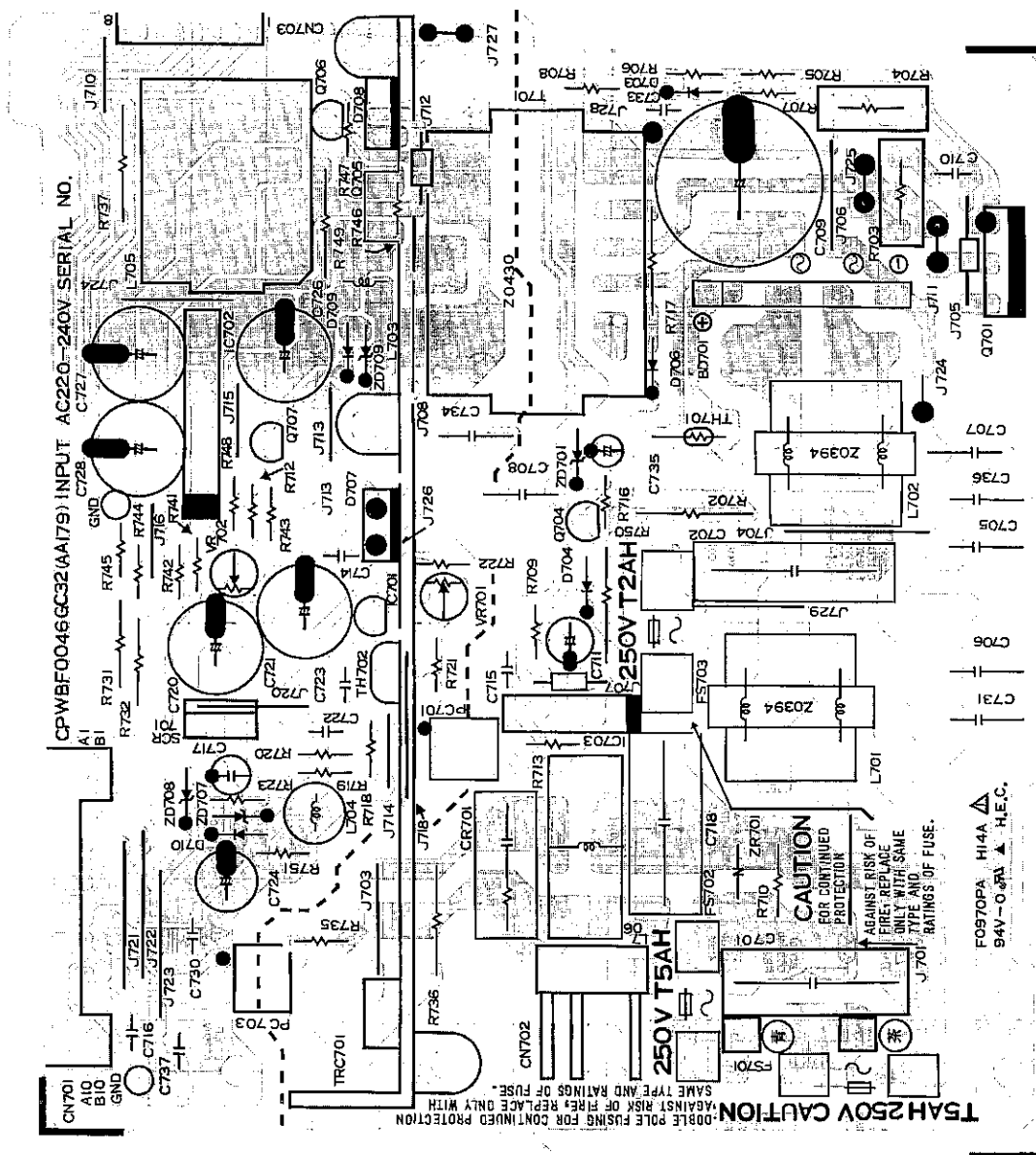
2-2. POWER SUPPLY P.W.B (100V SERIES)



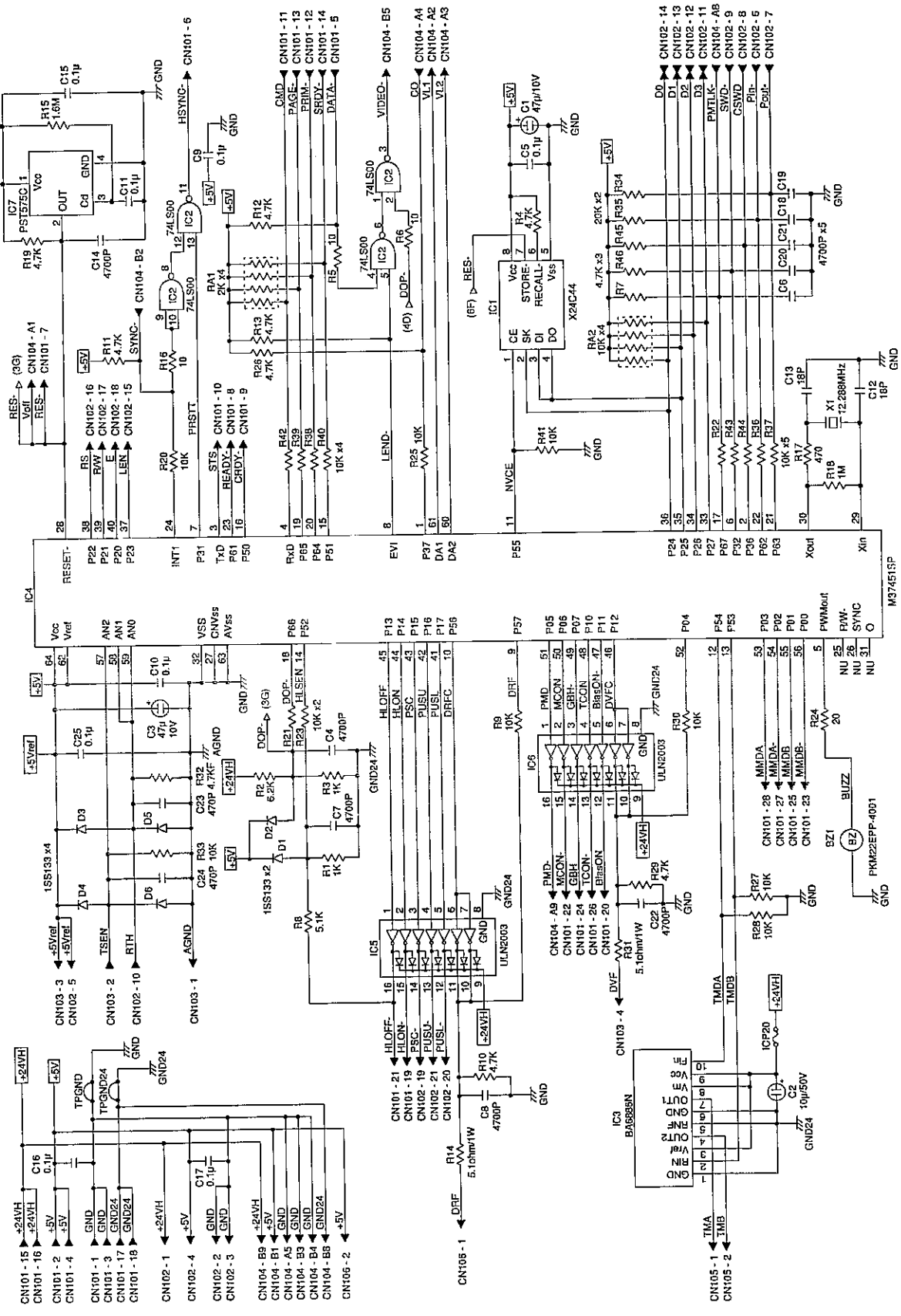
2-3. POWER SUPPLY CIRCUIT (200V SERIES)



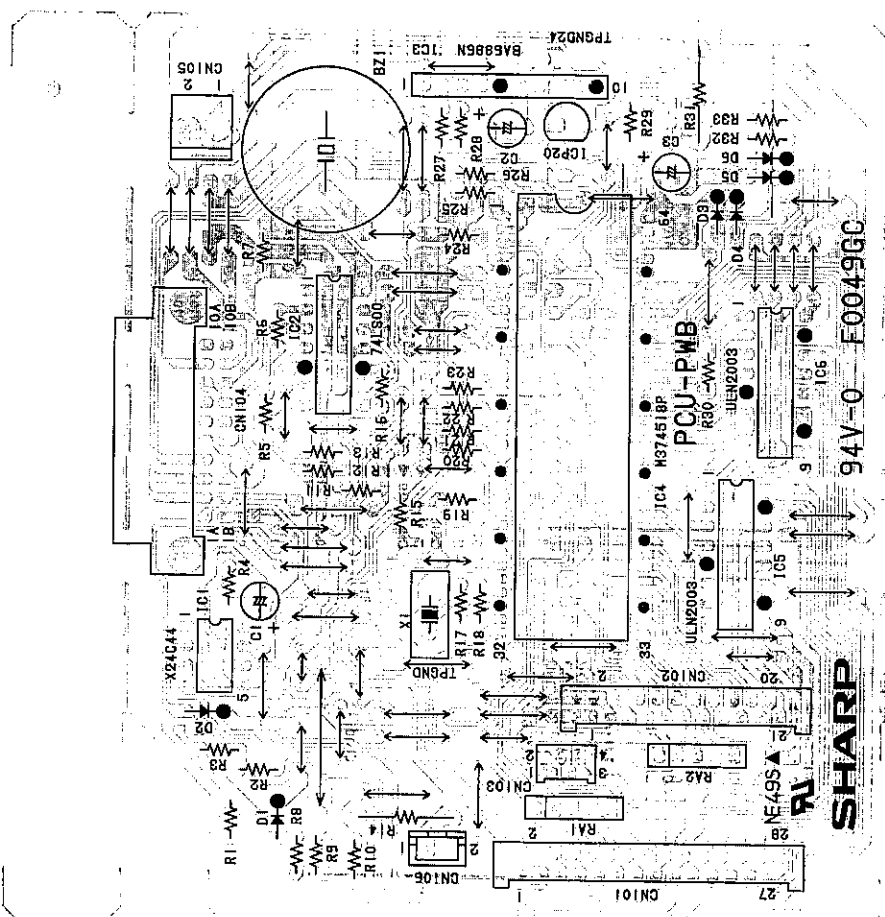
2-4. POWER SUPPLY P.W.B (200V SIERES)



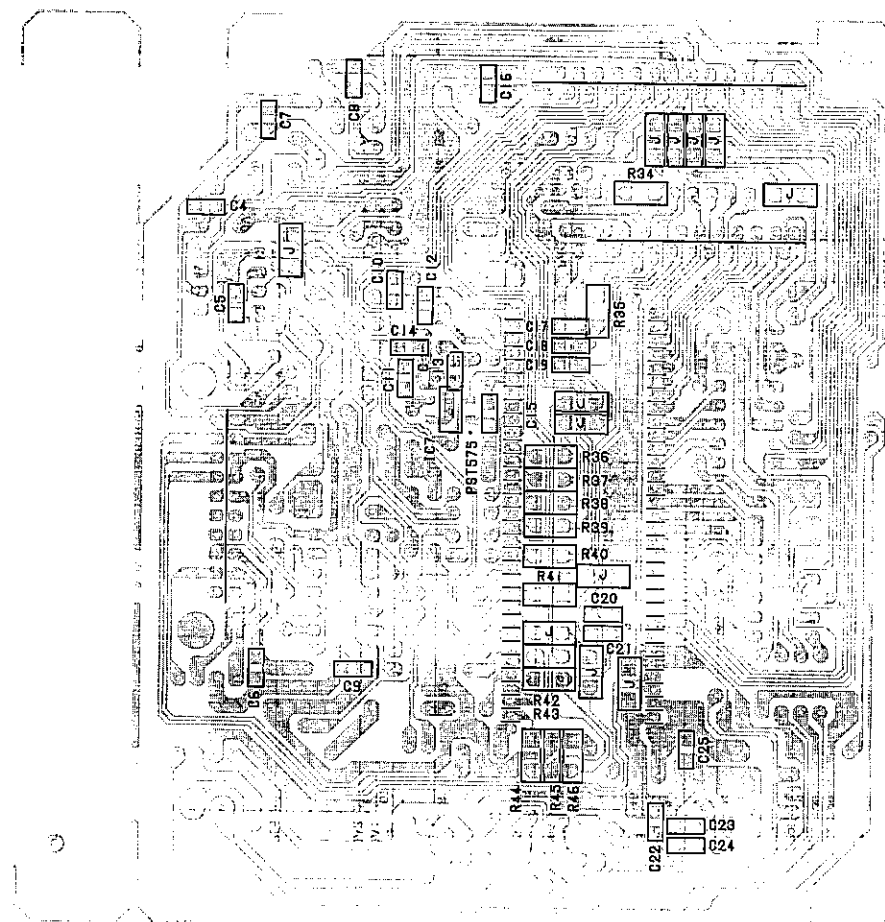
3-1. PCU CIRCUIT



3-2. PCU P.W.B

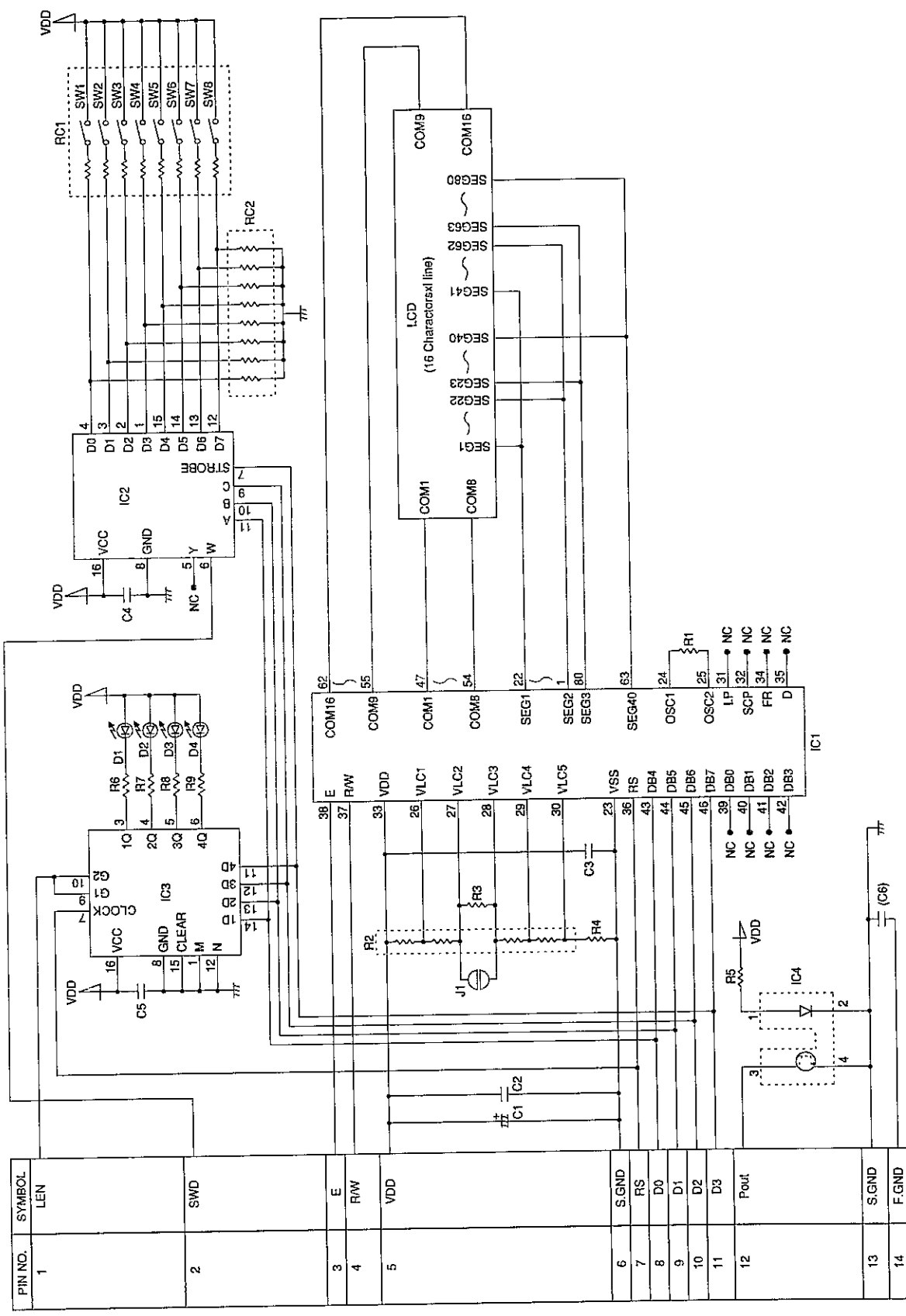


Top view

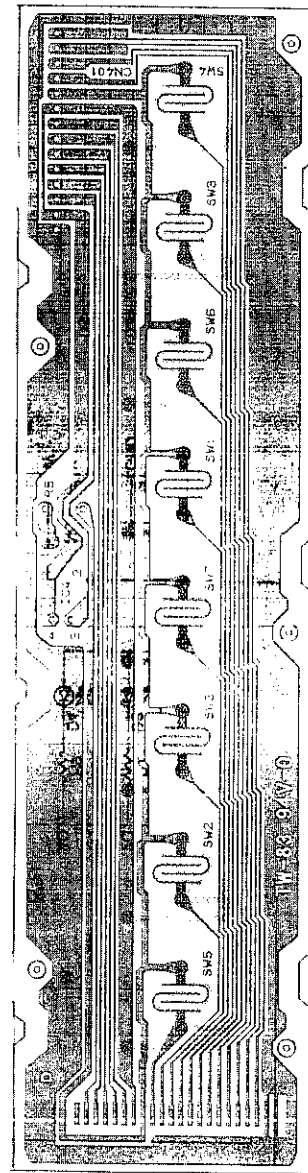
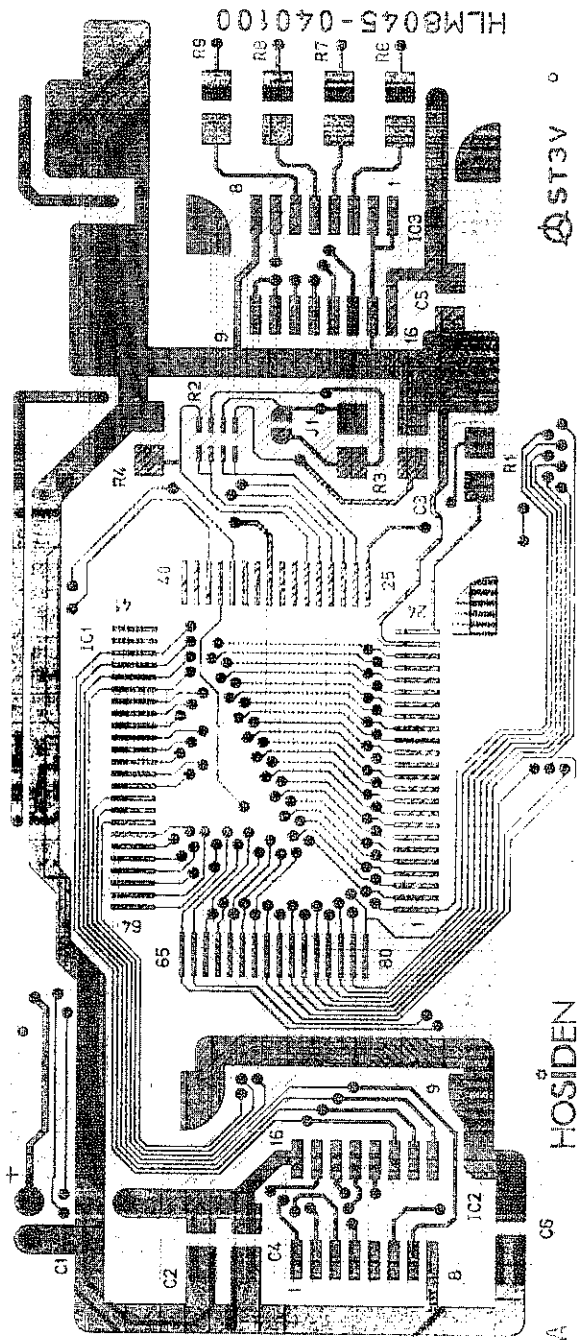


Bottom view

4-1. OPERATION CIRCUIT



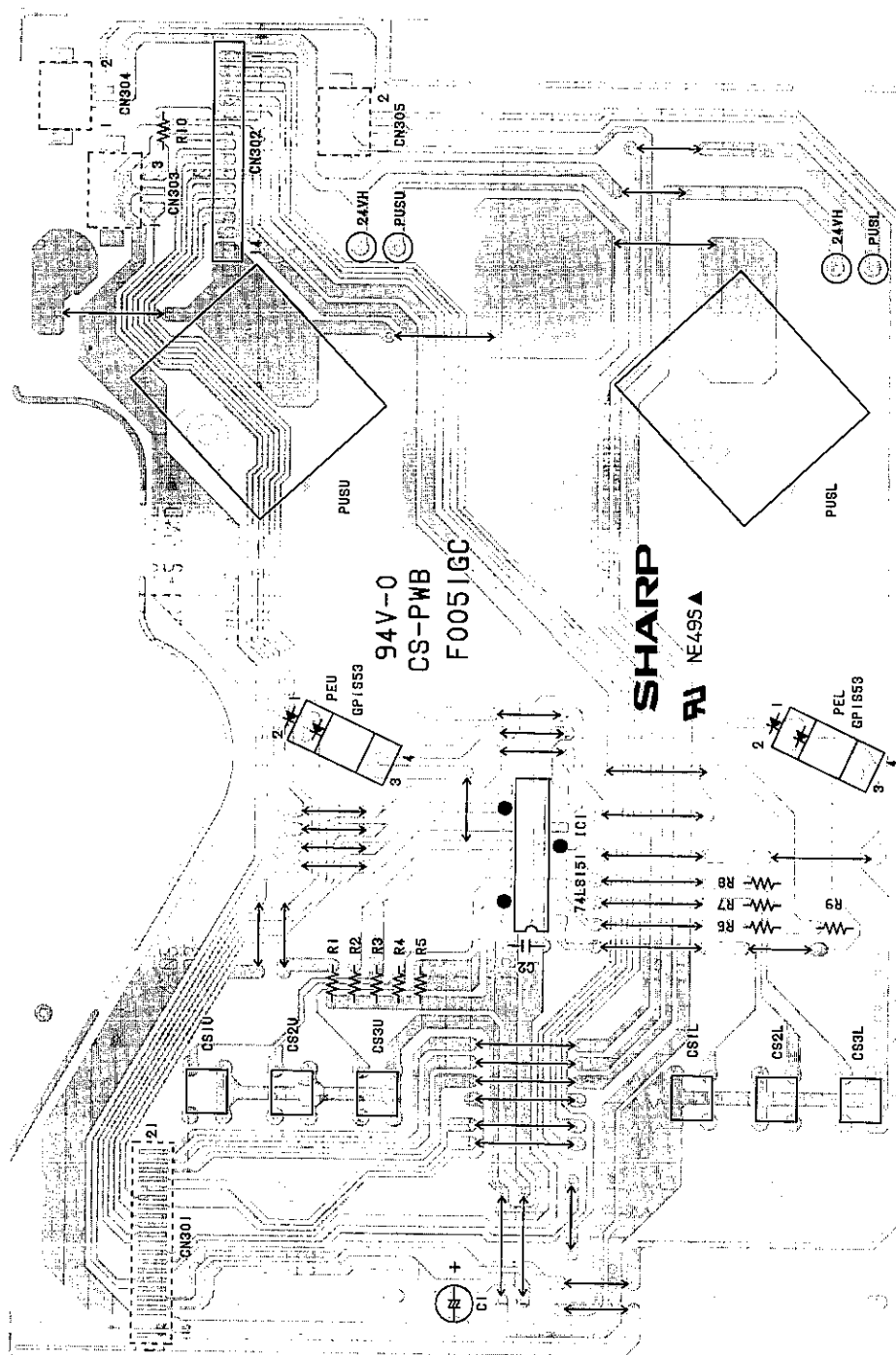
4-2. OPERATION P.W.B



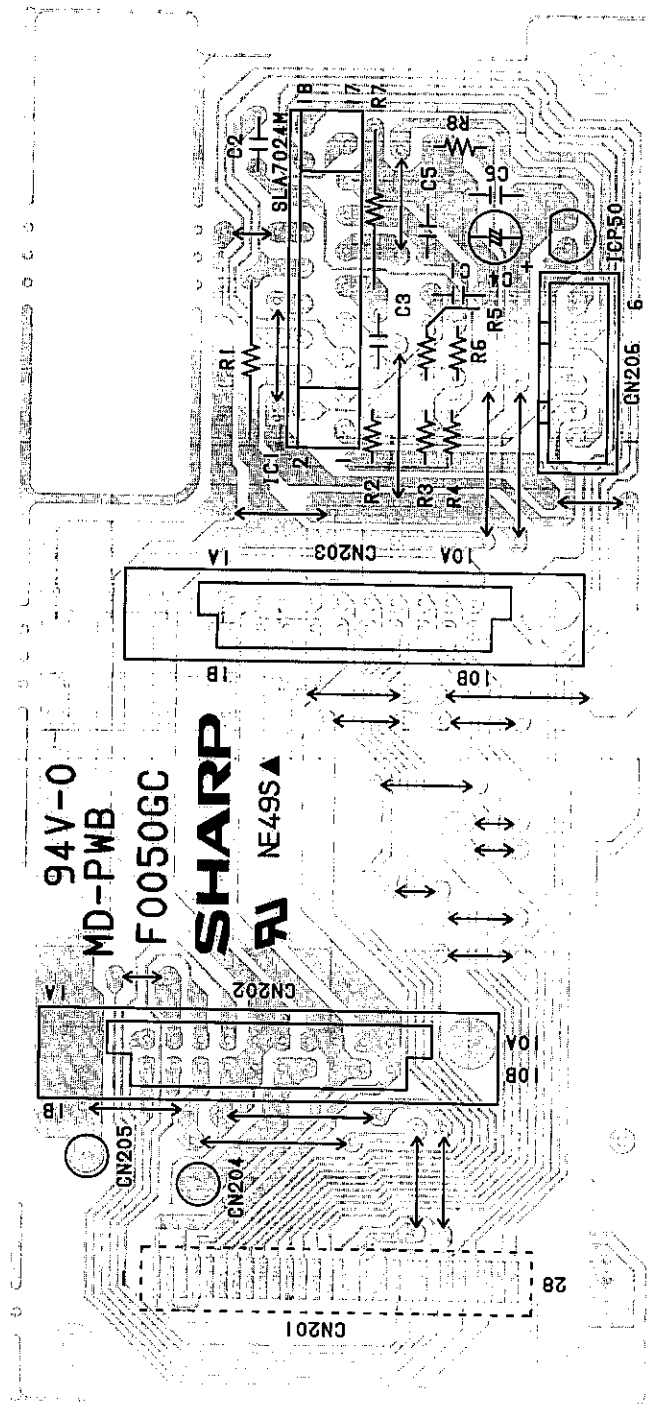
JX-9600



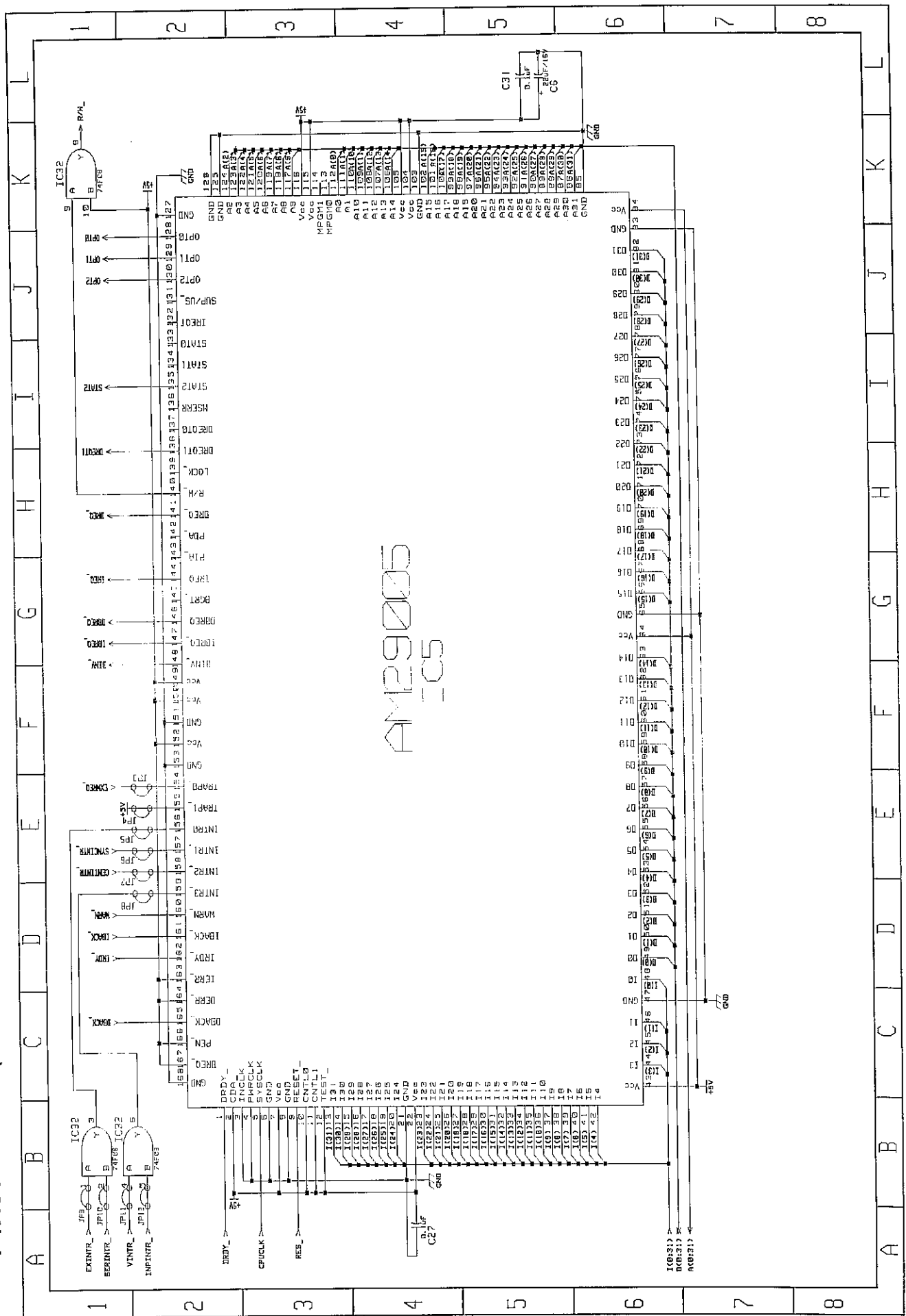
5-2. CASSETTE SWITCH P.W.B



6-2. MOTOR DRIVE P.W.B

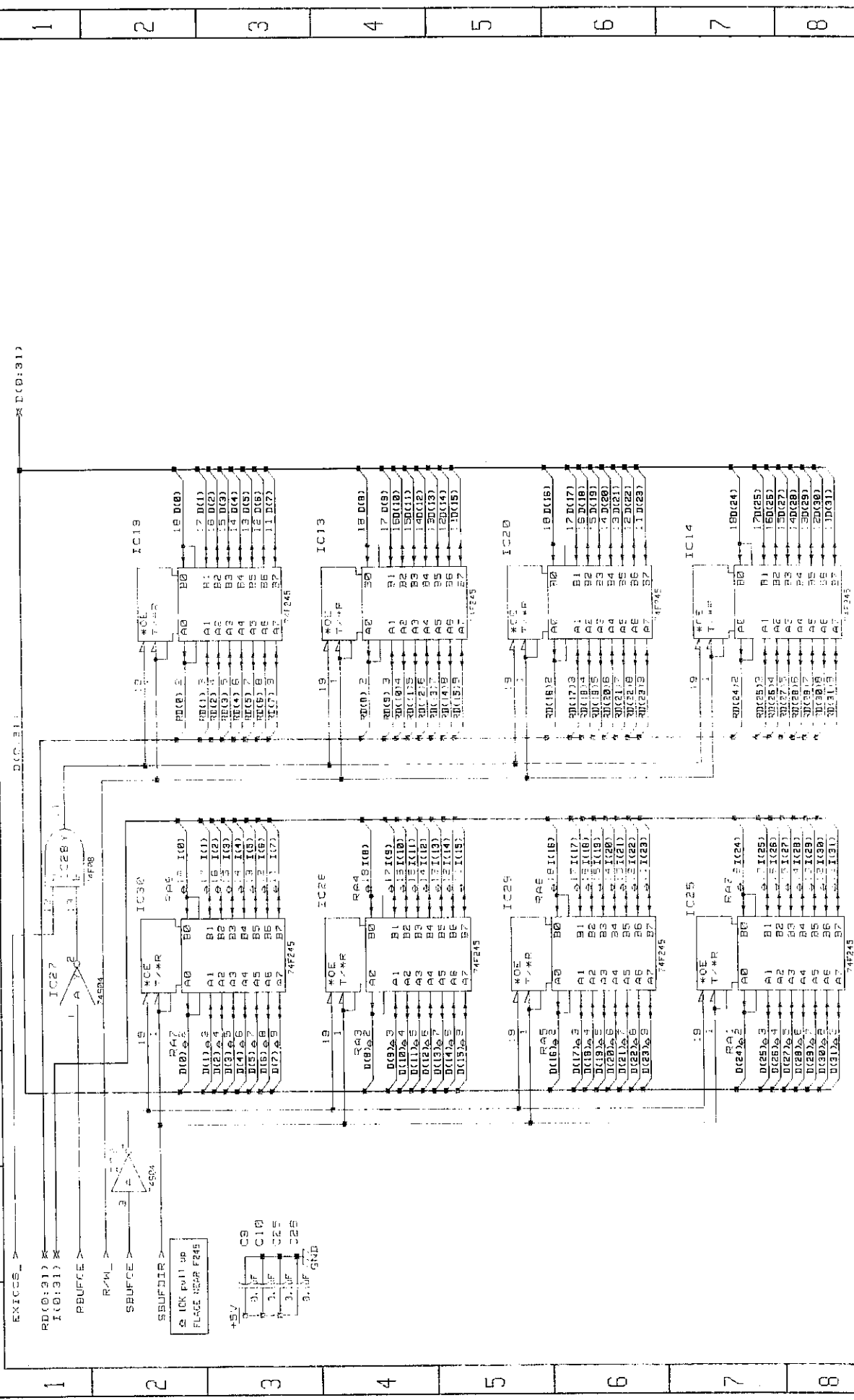


7-1. ICU CIRCUIT (CPU-SECTION)



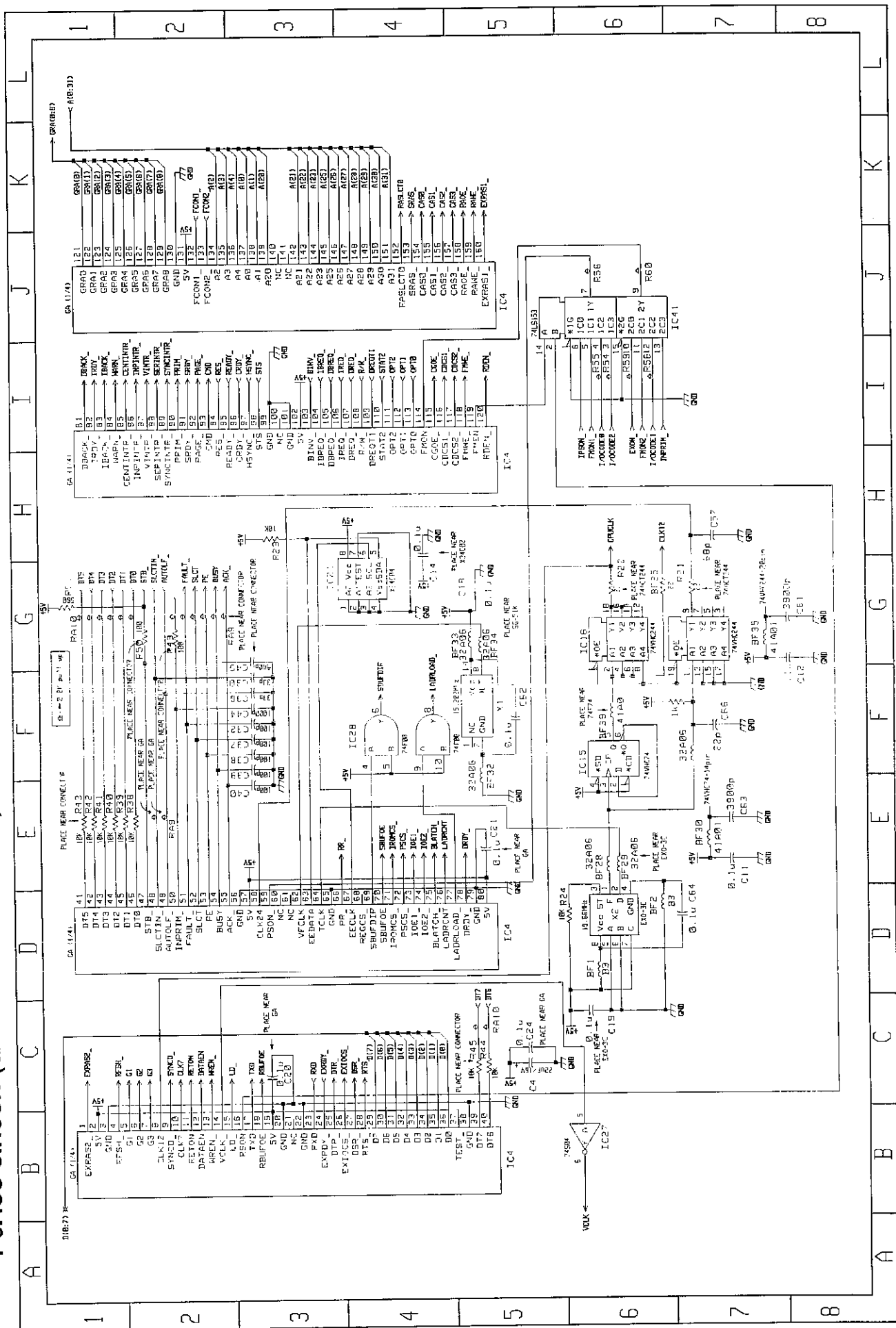


7-3. ICU CIRCUIT (DATA BUFFER SECTION)



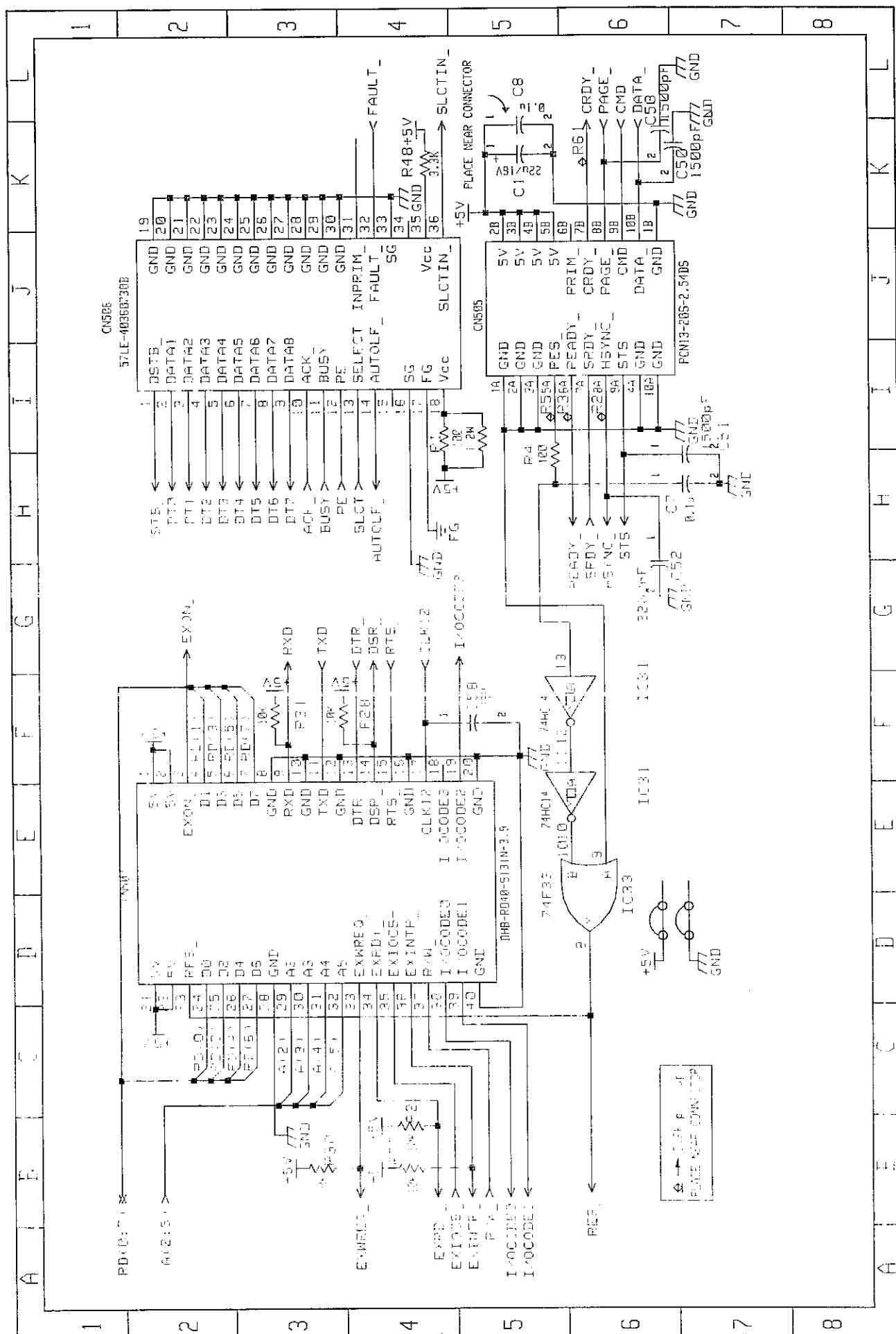


7-5. ICU CIRCUIT (GATE ARRAY SECTION)



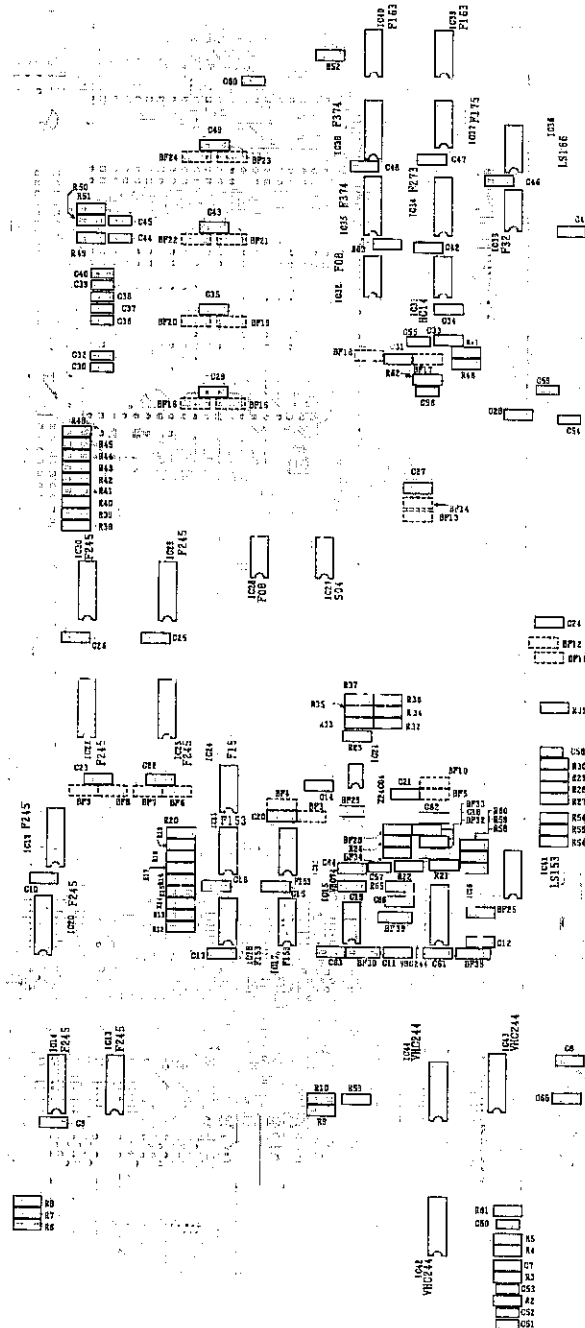
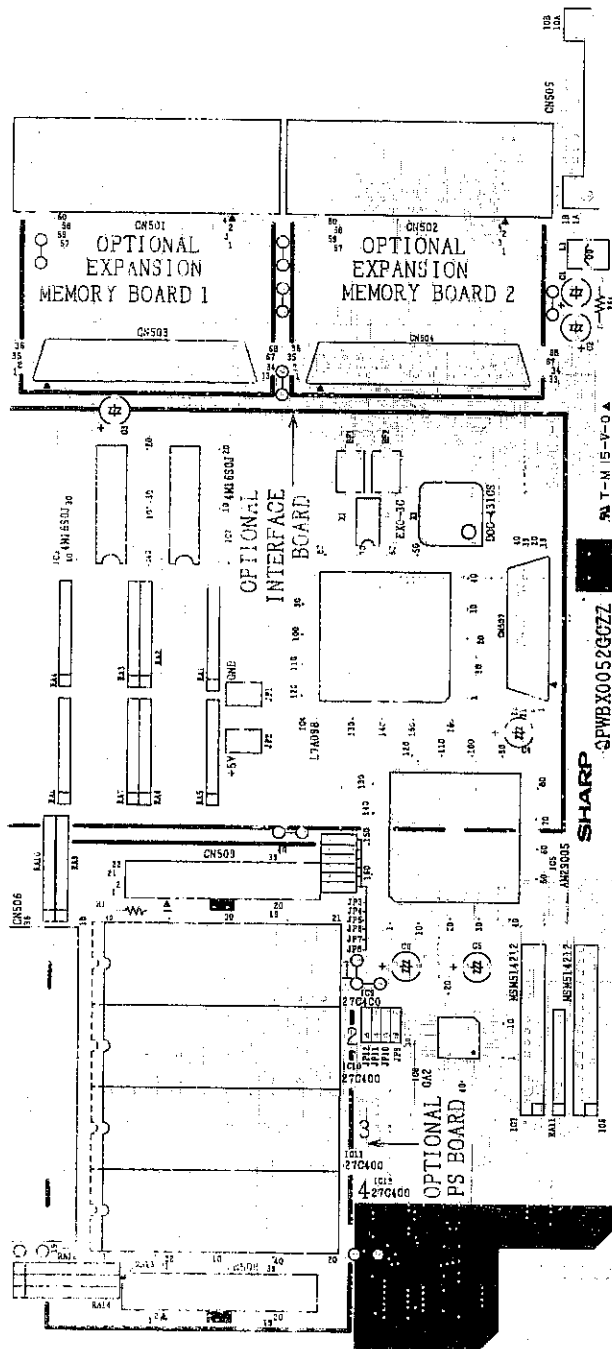


7.7. ICU CIRCUIT (CONNECTOR SECTION-1)

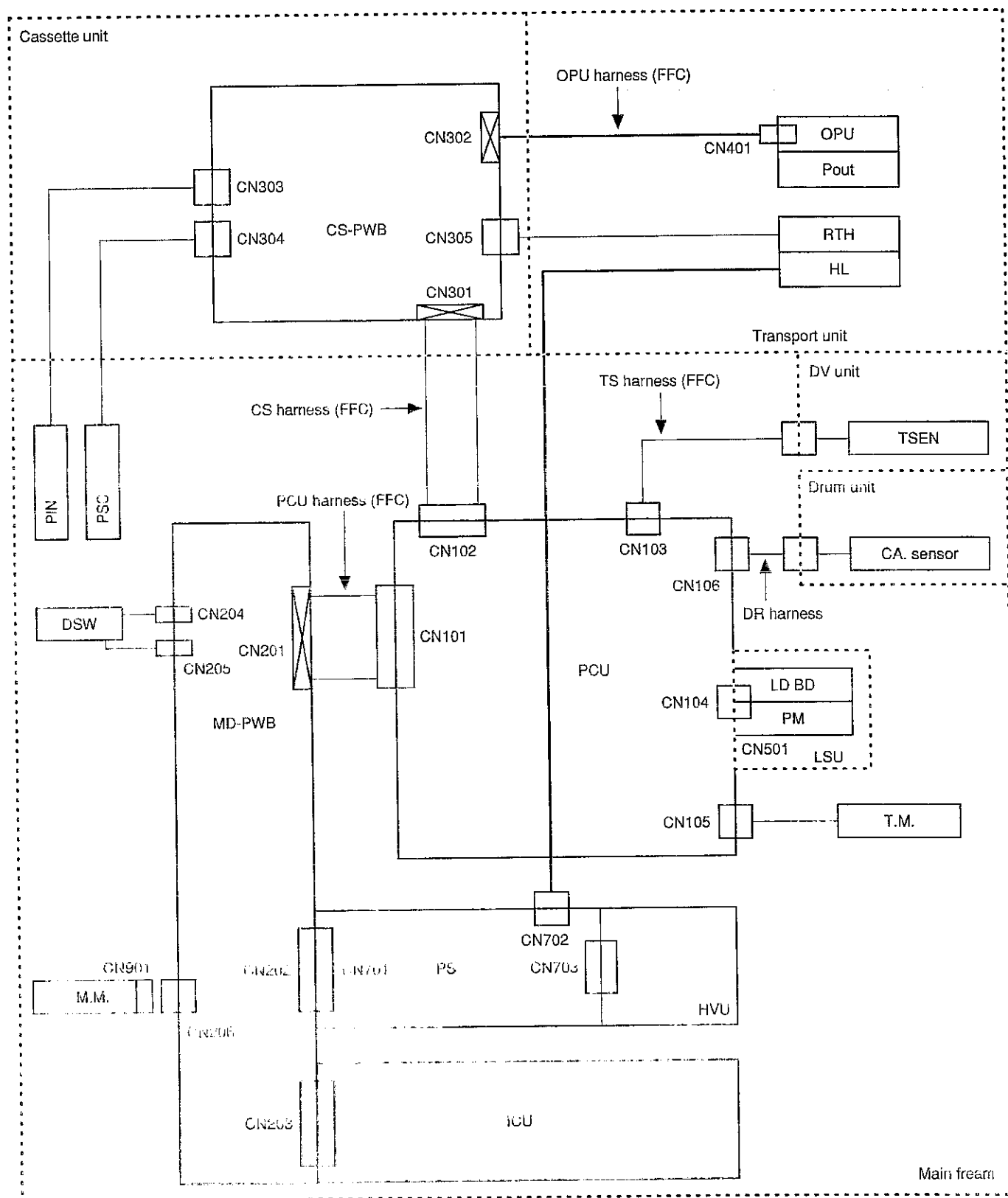




7-10. ICU (INTERFACE CONTROL UNIT) P.W.B



8. WIRING DIAGRAM



9. CONNECTOR SIGNAL NAME

9-1. PCU connector pin assignment

CN101

| PCU-MD | |
|--------|--------|
| PIN | NAME |
| 1 | GND |
| 2 | +5V |
| 3 | GND |
| 4 | +5V |
| 5 | DATA |
| 6 | HSYNC |
| 7 | RES |
| 8 | READY |
| 9 | CRDY |
| 10 | STS |
| 11 | CMD |
| 12 | PRIM |
| 13 | PAGE |
| 14 | SRDY |
| 15 | +24VH |
| 16 | +24VH |
| 17 | GND24 |
| 18 | GND24 |
| 19 | HLOW |
| 20 | BiasON |
| 21 | HLOW |
| 22 | MCON |
| 23 | MMDB |
| 24 | GBH |
| 25 | MMDB |
| 26 | TCON |
| 27 | MMDA |
| 28 | MMDA |

CN102

| PCU-CS | |
|--------|--------|
| PIN | NAME |
| 1 | +24V |
| 2 | GND |
| 3 | GND |
| 4 | +5V |
| 5 | +5Vref |
| 6 | Pin |
| 7 | Pout |
| 8 | CSWD |
| 9 | SWD |
| 10 | RTH |
| 11 | D3 |
| 12 | D2 |
| 13 | D1 |
| 14 | D0 |
| 15 | LEN |
| 16 | RS |
| 17 | RW |
| 18 | E |
| 19 | PSC |
| 20 | PUSL |
| 21 | PUSU |

CN103

| PCU-TS | |
|--------|--------|
| PIN | NAME |
| 1 | AGND |
| 2 | TSEN |
| 3 | +5Vref |
| 4 | DVF |

CN104

| PCU-LSU | | | |
|---------|-------|-----|-------|
| PIN | NAME | PIN | NAME |
| A1 | Voff | B1 | +5V |
| A2 | VL1 | B2 | SYNC |
| A3 | VL2 | B3 | GND |
| A4 | CO | B4 | GND |
| A5 | GND | B5 | VIDEO |
| A6 | NC | B6 | NC |
| A7 | NC | B7 | NC |
| A8 | PMTLK | B8 | GND24 |
| A9 | PMD | B9 | B9 |
| A10 | NC | B10 | NC |

CN105

| PCU-T. MOTOR | |
|--------------|------|
| PIN | NAME |
| 1 | TMA |
| 2 | TMB |

CN106

| PCU-DR. SENSOR | |
|----------------|------|
| PIN | NAME |
| 1 | DRF |
| 2 | +5V |

9-2. MD-PWB connector pin assignment

CN201

| MD-PCU | |
|--------|--------|
| PIN | NAME |
| 1 | GND |
| 2 | +5V |
| 3 | GND |
| 4 | +5V |
| 5 | DATA |
| 6 | HSYNC |
| 7 | RES |
| 8 | READY |
| 9 | DRDY |
| 10 | STS |
| 11 | CMD |
| 12 | PRIM |
| 13 | PAGE |
| 14 | SRDY |
| 15 | +24VH |
| 16 | +24VH |
| 17 | GND24 |
| 18 | GND24 |
| 19 | HLOW |
| 20 | BiasON |
| 21 | HLOW |
| 22 | MCON |
| 23 | MMDB |
| 24 | GBH |
| 25 | MMDB |
| 26 | TCON |
| 27 | MMDA |
| 28 | MMDA |

CN202

| MD-PS | | | |
|-------|--------|-----|-------|
| PIN | NAME | PIN | NAME |
| 1A | MCON | 1B | HLOW |
| 2A | TCON | 2B | HLOW |
| 3A | BiasON | 3B | +24VH |
| 4A | GBH | 4B | GND24 |
| 5A | GND24 | 5B | GND24 |
| 6A | GND24 | 6B | +24V |
| 7A | GND | 7B | +24V |
| 8A | GND | 8B | GND |
| 9A | +5V | 9B | GND |
| 10A | +5V | 10B | +5V |

CN203

| MD-ICU | | | |
|--------|-------|-----|------|
| PIN | NAME | PIN | NAME |
| 1A | GND | 1B | GND |
| 2A | GND | 2B | +5V |
| 3A | GND | 3B | +5V |
| 4A | GND | 4B | +5V |
| 5A | RES | 5B | +5V |
| 6A | READY | 6B | PRIM |
| 7A | SRDY | 7B | CRDY |
| 8A | HSYNC | 8B | PAGE |
| 9A | STS | 9B | CMD |
| 10A | GND | 10B | DATA |

CN206

| MD-MM | |
|-------|------|
| PIN | NAME |
| 1 | COMA |
| 2 | MMA |
| 3 | MMA |
| 4 | COMB |
| 5 | MMB |
| 6 | MMB |

CN204

| MD-DSW | |
|--------|-------|
| PIN | NAME |
| 1 | +24VH |

CN205

| MD-DSW | |
|--------|------|
| PIN | NAME |
| 1 | +24V |

9-3. CS-PWB connector pin assignment

CN301

| MD-PCU | |
|--------|--------|
| PIN | NAME |
| 1 | +24VH |
| 2 | GND |
| 3 | GND |
| 4 | +5V |
| 5 | +5Vref |
| 6 | Pin |
| 7 | Pout |
| 8 | CSWD |
| 9 | SWD |
| 10 | RTH |
| 11 | D3 |
| 12 | D2 |
| 13 | D1 |
| 14 | D0 |
| 15 | LEN |
| 16 | RS |
| 17 | RW |
| 18 | E |
| 19 | PSC |
| 20 | PUSL |
| 21 | PUSU |

CN303

| CS-Pin | |
|--------|------|
| PIN | NAME |
| 1 | Pin |
| 2 | GND |
| 3 | +5VP |

CN304

| CS-PSC | |
|--------|-------|
| PIN | NAME |
| 1 | +24VH |
| 2 | PSC |

CN305

| CS-RTH | |
|--------|--------|
| PIN | NAME |
| 1 | RTH |
| 2 | +5Vref |

CN302

| CS-OPU | |
|--------|------|
| PIN | NAME |
| 1 | LEN |
| 2 | SWD |
| 3 | E |
| 4 | RW |
| 5 | +5V |
| 6 | GND |
| 7 | RS |
| 8 | D0 |
| 9 | D1 |
| 10 | D2 |
| 11 | D3 |
| 12 | Pout |
| 13 | GND |
| 14 | FG |

9-4. Operation PWB connector pin assignment

CN401

| OPU-CS | |
|--------|------|
| PIN | NAME |
| 1 | LEN |
| 2 | SWD |
| 3 | E |
| 4 | RW |
| 5 | +5V |
| 6 | GND |
| 7 | RS |
| 8 | D0 |
| 9 | D1 |
| 10 | D2 |
| 11 | D3 |
| 12 | Pout |
| 13 | GND |
| 14 | FG |

9-5. Laser scanner unit connector pin assignment

CN501

| LSU-PCU | | | |
|---------|-------|-----|-------|
| PIN | NAME | PIN | NAME |
| A1 | Voff | B1 | +5V |
| A2 | VL1 | B2 | SYNC |
| A3 | VL2 | B3 | GND |
| A4 | CO | B4 | GND |
| A5 | GND | B5 | VIDEO |
| A6 | NC | B6 | NC |
| A7 | NC | B7 | NC |
| A8 | PMTLK | B8 | GND24 |
| A9 | PMD | B9 | B9 |
| A10 | NC | B10 | NC |

9-6. Power supply PWB connector pin assignment

CN701

| PS-MD | | |
|-------|--------|----------|
| PIN | NAME | PIN NAME |
| 1A | MCON | 1B HLOFF |
| 2A | TCON | 2B HLON |
| 3A | BiasON | 3B +24VH |
| 4A | GBH | 4B GND24 |
| 5A | GND24 | 5B GND24 |
| 6A | GND24 | 6B +24V |
| 7A | GND | 7B +24V |
| 8A | GND | 8B GND |
| 9A | +5V | 9B GND |
| 10A | +5V | 10B +5V |

CN702

| PS-FUSER | |
|----------|------|
| PIN | NAME |
| 1 | HLN |
| 2 | NC |
| 3 | NC |
| 4 | HLL |

CN703

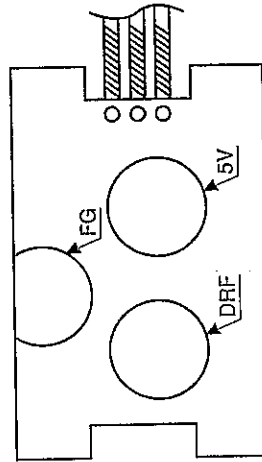
| PS-HVJ | |
|--------|--------|
| PIN | NAME |
| 1 | MCON |
| 2 | TCON |
| 3 | BiasON |
| 4 | GBH |
| 5 | GND24 |
| 6 | GND24 |
| 7 | +24VH |
| 8 | +24VH |

9-7. Main motor connector pin assignment

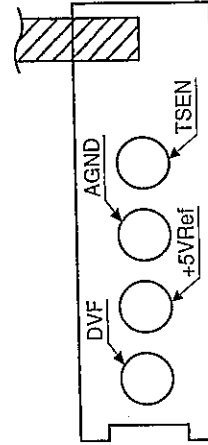
CN901

| MM-MD | |
|-------|------|
| PIN | NAME |
| 1 | MMA |
| 2 | NCD |
| 3 | COMA |
| 4 | NC |
| 5 | MMA |
| 6 | NC |
| 7 | MMB |
| 8 | NC |
| 9 | COMB |
| 10 | NC |
| 11 | MMB |

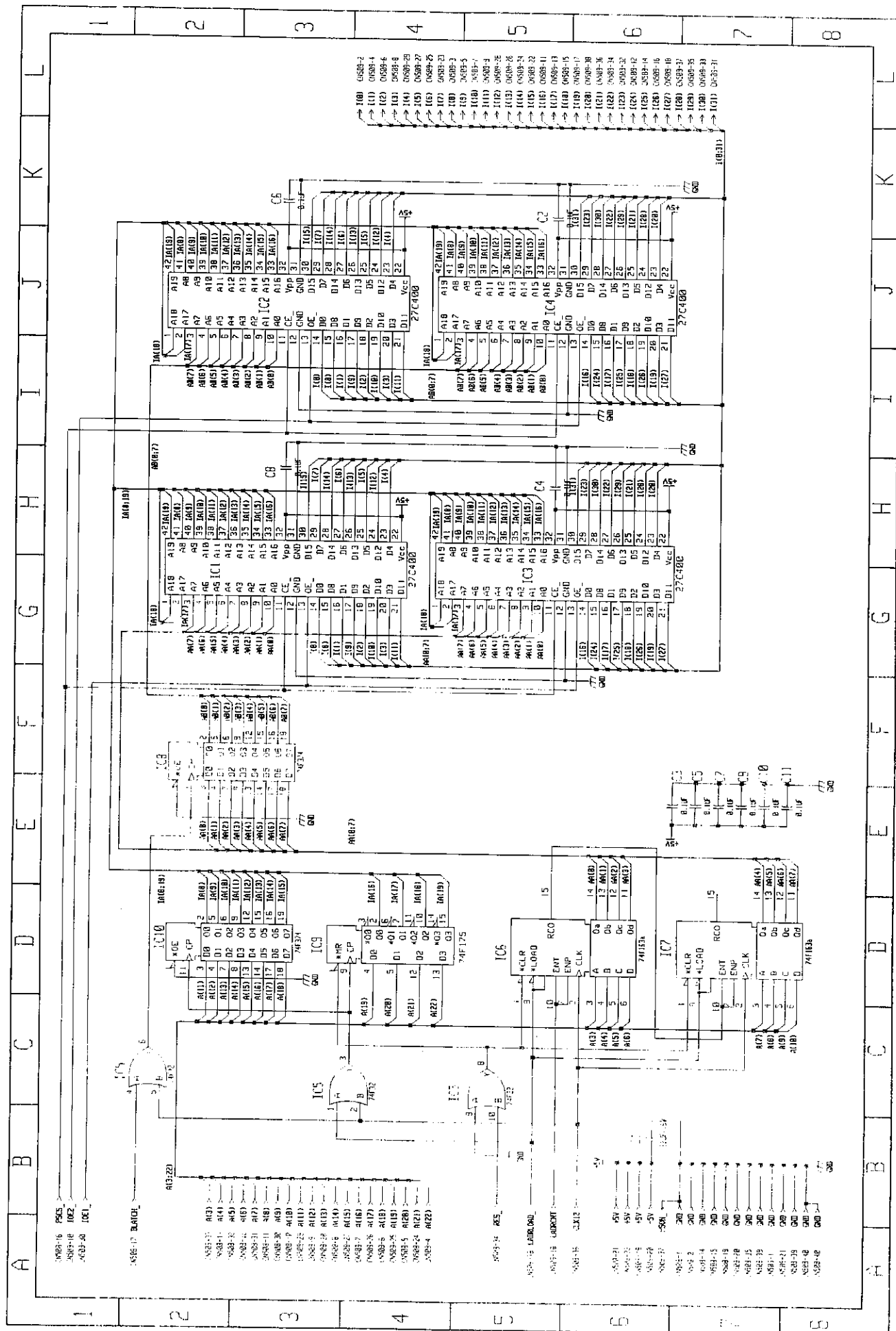
9-8/ Drum connect PWB pin assignment



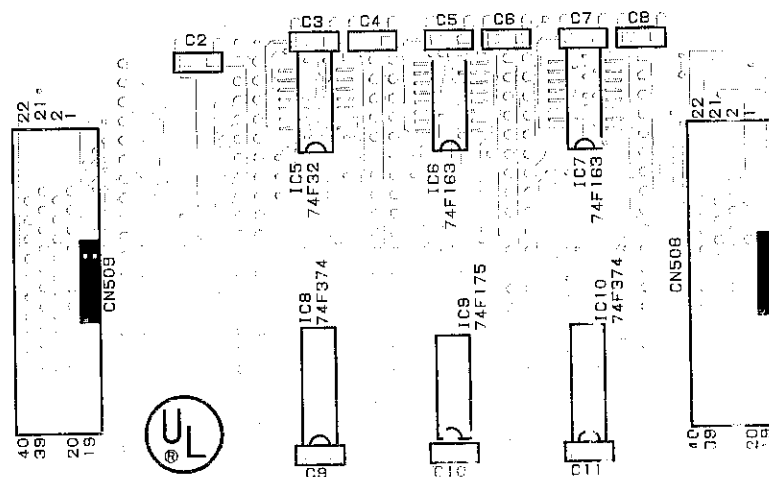
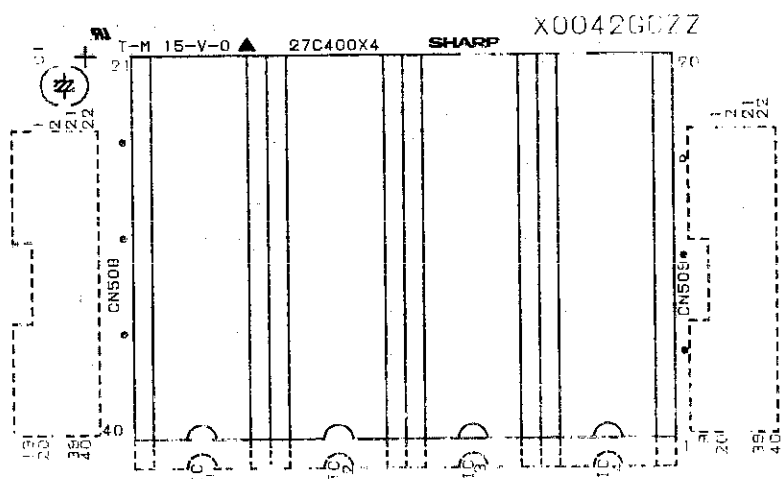
9-9. Toner sensor PWB pin assignment



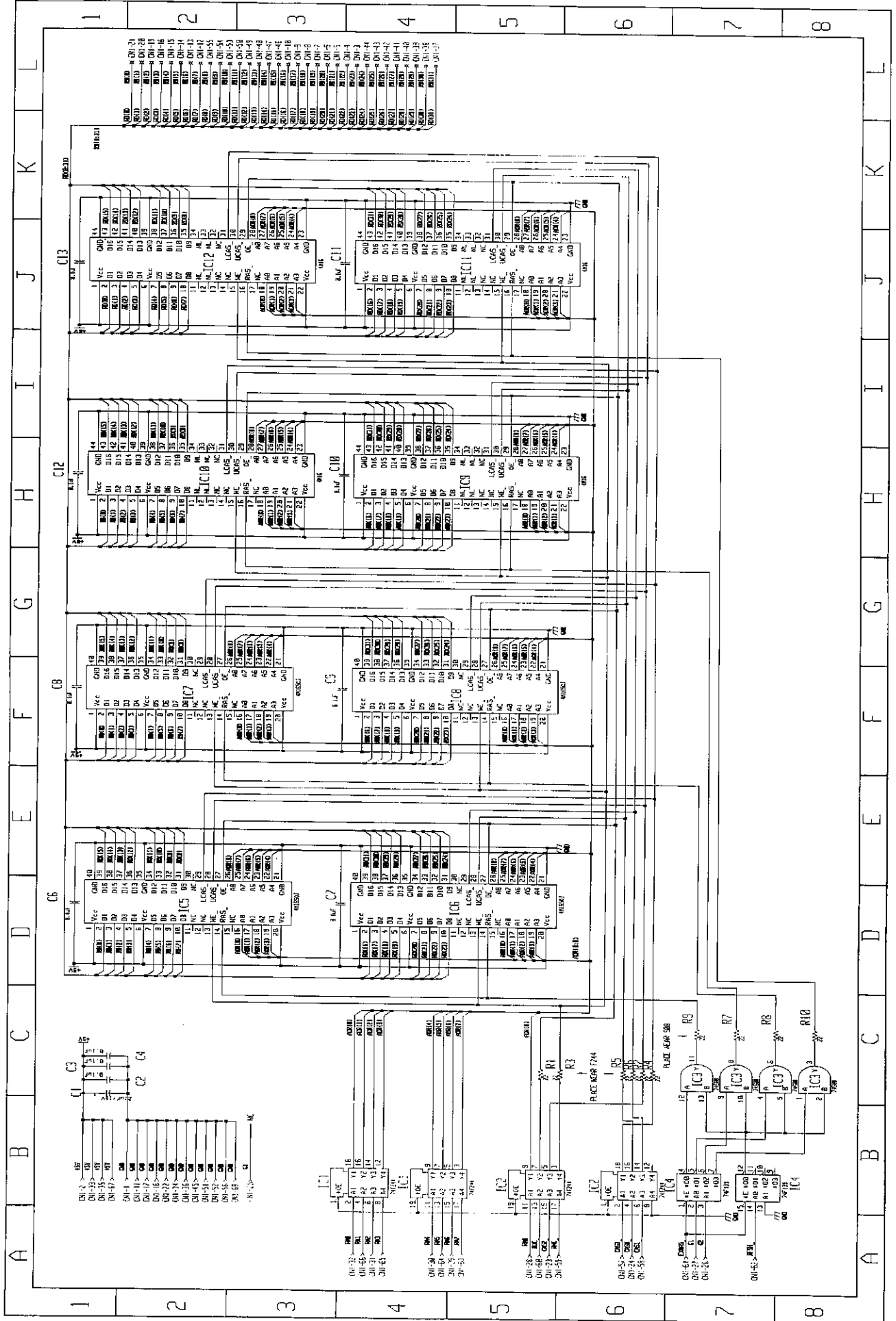
10. P.S. CIRCUIT



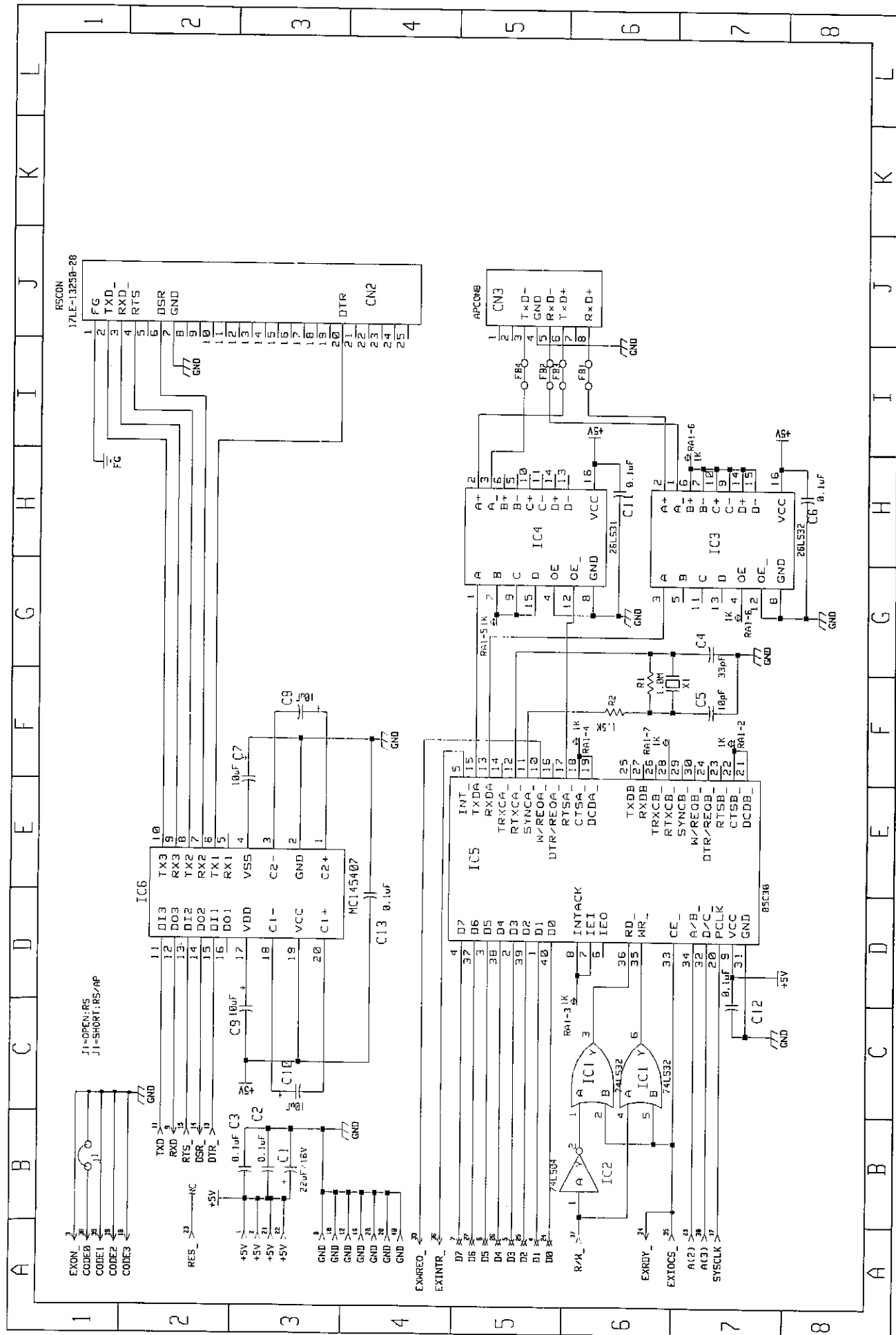
10. P.S P.W.B



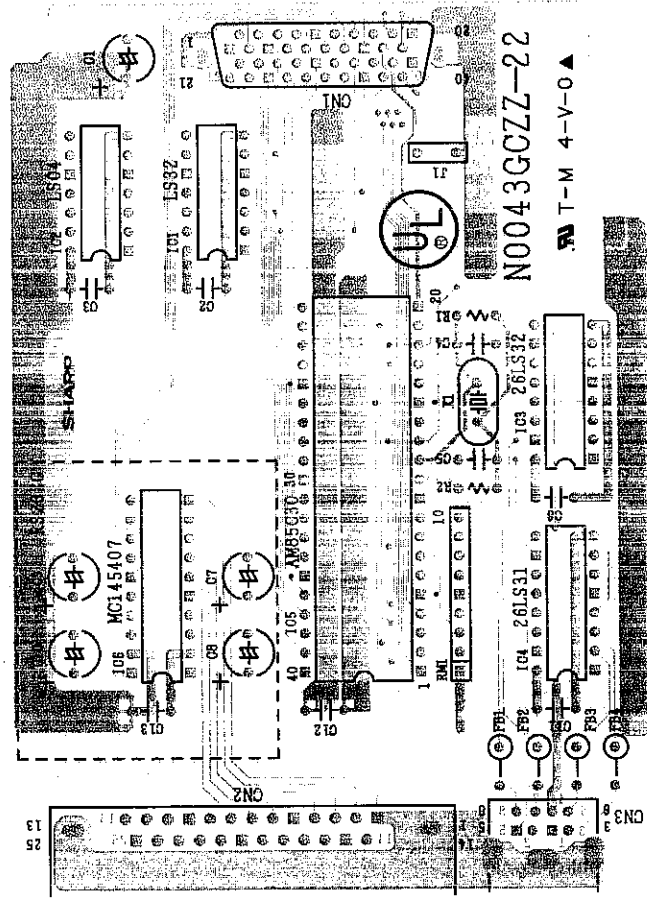
11. EXPANSION MEMORY CIRCUIT



12. APPLE TALK/RS232C I/F CIRCUIT



12. APPLE TALK/RS232C I/F P.W.B



13. SIGNAL LIST (Printer section)

| Signal name | Function |
|-------------|--|
| Xin | CPU Clock input |
| Xout | CPU Clock output |
| RES | CPU reset signal |
| NVCE | NVRAM chip enable signal |
| D3~0 | LCD control data bus, key signal address, LED data bus, NARAM signal |
| CSWD | Cassette size, paper out detect signal |
| BUZZ | Buzzer signal |
| PRSTT | Print start signal |
| SYNC | Horizontal synchronous signal |
| LEND | Line end signal |
| DATA | Print data signal (from ICU) |
| VIDEO | Print data signal (to LSU) |
| HSYNC | Horizontal synchronous signal (to ICU) |
| STS | Status output signal (to ICU) |
| CMD | Command input signal (from ICU) |
| SRDY | Status ready signal (from ICU) |
| CRDY | Command ready signal (to ICU) |
| PAGE | Print action start signal (from ICU) |
| PRIM | PCU initialize request signal (from ICU) |
| READY | Print ready signal (to ICU) |
| LEN | LED control enable signal |
| RS | LCD control resistor selection signal |
| R/W | LCD control data read/ write signal, H:read |
| E | LCD control data synchronous signal |
| SWD | Key input signal from OPU |
| TSEN | Toner sensor input signal (analog) |
| RTH | Thermistor input signal (analog) |
| DOP | Cover open detect signal |
| Pout | Paper exit sensor signal |
| Pin | Pin sensor signal |
| PMD | Polygon motor drive signal, L:Polygon motor ON |
| PMTLK | Polygon motor lock signal |
| CO | Laser power control signal |
| VL2 | Laser power control signal (analog) |
| VL1 | Laser power control signal (analog) |
| Voff | Laser power off signal |
| PUSL | Lower paper feed solenoid control signal, L:PUSL ON |
| PUSU | Upper paper feed solenoid control signal, L:PUSU ON |
| PSC | Paper stopper clutch control signal, L:PSC ON |
| DRFC | Drum unit cartridge sensor cut signal, H:sensor cut |
| DRF | Drum unit cartridge sensor detect signal, H;New Drum |
| DVFC | DV unit cartridge sensor cut signal , H:sensor cut |
| DVF | DV unit cartridge sensor detect signal , H:New DV |
| HLSEN | Heater lamp control abnormal detect signal |
| HLON | Heater lamp control signal, L:Heater lamp ON |
| HLOFF | Heater lamp control signal, L:Heater lamp OFF |
| BiasON | Biad control signal, H:Bias ON |

| Signal name | Function |
|-------------|--|
| TCON | Transfer corona control signal, L:Transfer corona ON |
| GBH | Glid bias control signal, H:Glid bias HIGH |
| MCON | Main corona control signal, L:Main corona ON |
| TMDA | Toner motor drive signal |
| TMDB | Toner motor drive signal |
| TMA | Toner motor output |
| TMB | Toner motor output |
| MMDA | Main motor drive signal |
| MMDA | Main motor drive signal |
| MMDB | Main motor drive signal |
| MMDB | Main motor drive signal |
| COMA | Main motor output (common) |
| COMB | Main motor output (common) |
| MMA | Main motor output |
| MMA | Main motor output |
| MMB | Main motor output |
| MMB | Main motor output |

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